AGRICULTURAL *Chemicals*

In this issue

SEPTEMBER, 1955

FLY FLAKES

kills 'em fast ...and easy!

merely 1 scatter by hand

watch 'em 2 die

sweep 'em 3 up

The new, improved FLY FLAKES

- *Kill flies in minutes*
- *Kill resistant strains*
- *Kill maggots*
- *Are economical-to-use*
- *For dairy barns, feed rooms, poultry houses, manure piles, outside areas.*

FLY FLAKES, outstanding last year, are even more potent this year. The new, improved FLY FLAKES are the simplest, most effective and yet the most economical control devised.

Available in 1 lb. cans; 2, 5 and 10 lb. bags, and 25 lb. drums

*"FLY FLAKES" is a Trade Mark

MATHIESON

OLIN MATHIESON CHEMICAL CORPORATION

Insecticides Division

ONE PARK AVE., N.Y., N.Y. • BALTIMORE 3, MD. • LITTLE ROCK, ARK.

The United States

To all to whom these Presents shall come, Greeting.

Whereas Samuel Hopkins of the city of Philadelphia and State of Pensylvania hath discovered an Improvement, not known or used before such Discovery, in the making of Pot ash and Pearl ash by a new Apparatus and Process, that is to say, in the making of Pearl ash 1st by burning the raw Ashes in a Furnace, 2d by dissolving and boiling them when so burnt in Water, 3d by drawing off and settling the ley, and 4th by boiling the ley into salts which then are the fine Pearl ash, and also in the making of Pot ash by flaring the Pearl ash so made as aforesaid, which Operation of burning the raw Ashes in a Furnace, preparatory to their Dissolution and boiling in Water, is new, leaves little Residuum, and produces a much great Quantity of Salt: These are therefore in pursuance of the Act, entitled "An Act to promote the Progress of useful Arts" to grant to the said Samuel Hopkins, his Heirs, Administrators and Assigns, for the Term of fourteen Years, the sole and exclusive Right and Liberty of using and vending to others the said Discovery of burning the raw Ashes previous to their being dissolved and boiled in Water, according to the true Intent and Meaning of the Act aforesaid. In Testimony whereof I have caused these Letters to be made Patent, and the Seal of the United States to be hereunto affixed. Given under my Hand at the City of New York the thirty first Day of July in the Year of our Lord one thousand seven hundred & Ninety.

G. Washington

City of New York July 31st 1790.

I do hereby certify that the foregoing Letters Patent were delivered to me in pursuance of the Act, entitled "An Act to promote the Progress of useful Arts," that I have examined the same and find them conformable to the said Act.

Edm Randolph Attorney General for the United States.

Delivered to the within named Samuel Hopkins the fourth day of August 1790

Th. Jefferson

First United States Patent Grant
July 31, 1790

The First United States Patent . . .

was for potash

This is a reproduction, slightly reduced, of the first United States patent ever issued. It was granted in 1790 to Samuel Hopkins of Philadelphia, for a process for producing potash.

If you would like a full-size reproduction of this patent, on parchment paper, suitable for framing, a note to the Potash Company of America would be appreciated.

P.C.A.
The SALT of the EARTH
RED MURIATE

POTASH COMPANY OF AMERICA
CARLSBAD, NEW MEXICO.

General Sales Office . . . 1625 Eye Street, N.W., Washington, D.C.
Midwestern Sales Office . . . First National Bank Bldg., Peoria, Ill.
Southern Sales Office . . . Candler Building, Atlanta, Ga.

what GRANULAR ATTACLAY can do for YOU in the fast-growing GRANULAR MARKET

Shown here are several grades of Granular Attaclay. These photographs may help you select the mesh most suitable to your product. (Granules shown are actual size.)

Want a liberal share of the ever-expanding granular pesticide market? Granular ATTACLAY and M&C technical assistance can help you get it faster and easier.

MAKE A SUPERIOR PRODUCT! Granular ATTACLAY is produced from the same highly sorptive material as trade-preferred ATTACLAY. It combines ideally with toxicants. It suffers minimum breakdown in processing. And it's a most versatile and efficient means of formulating granular pesticides, fungicides or herbicides.

WIN A PROFITABLE MARKET! Growers who never used granular formulations before are demanding them now. The market includes small-package business for home lawns and gardens, as well as volume shipments for the control of mosquitos, pasture pests, corn root-worms and other insect bandits.

Another interesting above-the-ground use: Citrus tree mealy bug control, through control of the ants that aid and abet them. Natural insect enemies of the mealy bugs will destroy them if left undisturbed. Trouble is that ants continually molest these predators. Granular pesticides at the foot of the tree will control ants and leave predator insects free to destroy mealy bugs. And there'll be no poisonous residue left on fruit from dusting or spraying.

New 8-Page Bulletin, Technical Help, Samples.

Whatever your formulation, production or application problem, our years of field and laboratory experience with granular grades are immediately available to you. For prompt assistance, check and mail the coupon today.

ATTAPULGUS PRODUCTS *from*

MINERALS & CHEMICALS CORPORATION OF AMERICA

210 W. WASHINGTON SQUARE, PHILADELPHIA 5, PA.

ALWAYS A BETTER WAY...

MINERALS & CHEMICALS CORPORATION OF AMERICA
Dept. P, 210 W. Washington Square, Philadelphia 5, Pa.

☐ Please send new 8-page bulletin with full technical data on Granular Attaclay.

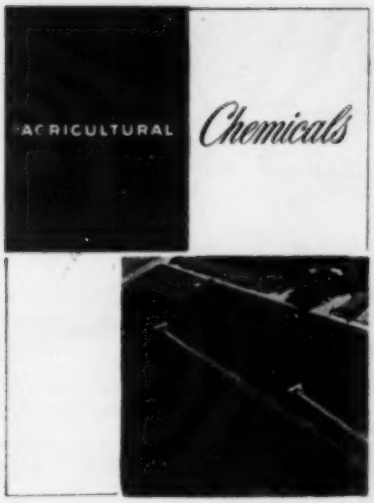
☐ I'm interested in free test samples of the following mesh sizes_____

name_____ position_____

company_____

address_____

city_____ zone_____ state_____



Use of planes for dusting crops at Seabrook farms is just one of many highly mechanized operations at the famous frozen food plant. Full details on agricultural chemicals used at this New Jersey farm are scheduled for a future issue of AC.

Vol 10. No. 9 September, 1955

AGRICULTURAL Chemicals

ARTICLES

FEATURES

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ENTERED as second-class matter November 4, 1949 at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

(Photo — Courtesy Soil Conservation Service, U. S. D. A.)

High Grade Muriate of Potash

by DUVAL

Duval Muriate of Potash ranks high as one of the essential nutrients which greatly increase yield and profits in crop production.

DUVAL SULPHUR and POTASH CO.
Modern Plant and Refinery at Carlsbad, New Mexico

Address all communications to:
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Masterpieces on KRAFT

SOME OF OUR CUSTOMERS are genuinely surprised at the clean, fresh, "contrasty" colors we can produce on kraft Multiwalls.

Much is due to our painstaking efforts to develop design and color schemes best suited to the product.

Much . . . *very* much . . . is due to our exclusive Kolorseal process of printing which assures our customers fast, clean colors and perfect registration.

May we show you comparative printings made by our Kolorseal process?

We think you, too, will be surprised. . . . A line from you will bring convincing evidence to your office . . . and *without* the slightest obligation!

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Phone 2-5461

Raymond

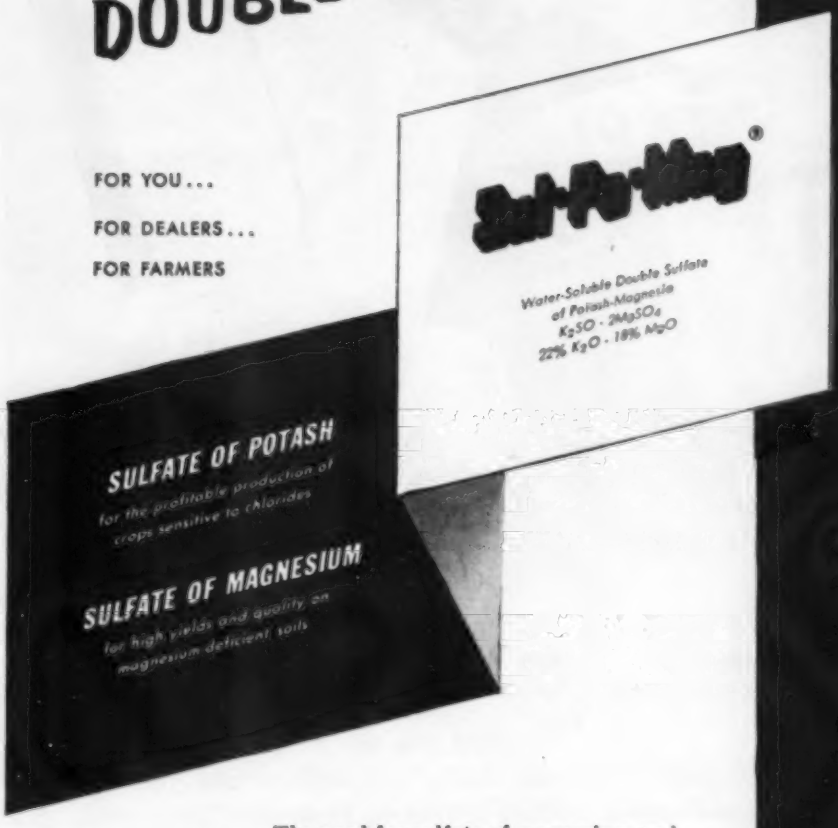
MULTIWALL PAPER SHIPPING SACKS

DOUBLE VALUE
DOUBLE POWER

FOR YOU...

FOR DEALERS...

FOR FARMERS



DOUBLE POWER

DOUBLE VALUE

The need for sulfate of magnesium and sulfate of potash for the profitable production of a wide variety of crops in many farming areas is shown by research carried on by many agricultural colleges.

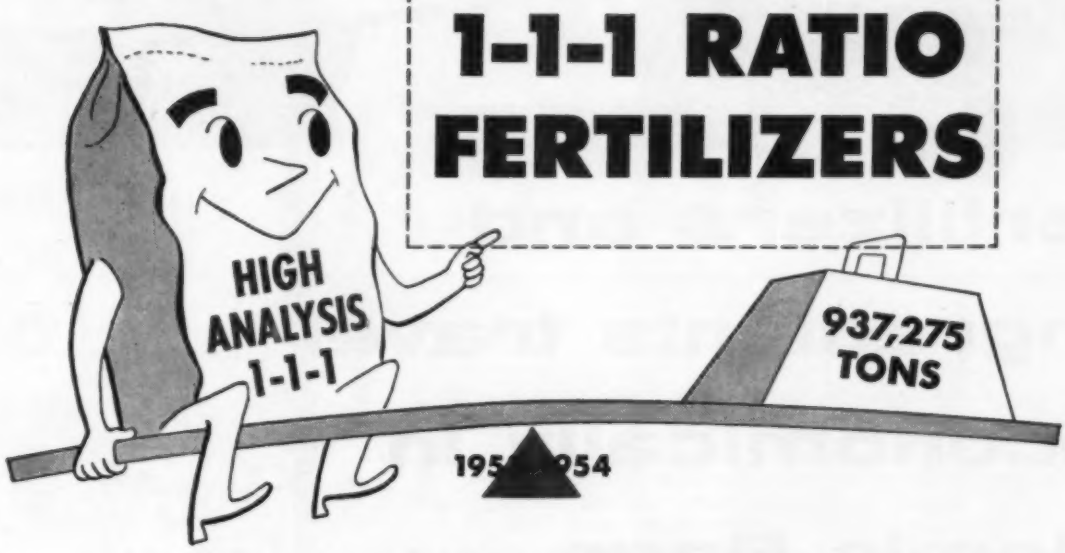
Consistent advertising in farm papers, and on radio and billboards is telling farmers that the most effective way to supply soluble magnesium and potash is to use a quality mixed fertilizer containing *Sul-Po-Mag*. We're building consumer acceptance for your premium grades – so cash in on the growing demand by using *Sul-Po-Mag* in the fertilizers you make for soils low in magnesium and potash. Identify your brand as a premium grade product by showing soluble magnesium in the analysis on the bag . . . $N\text{-}P\text{-}K_{Mg}$.

PUT IT IN THE BAG

PUT IT ON THE BAG

POTASH DIVISION INTERNATIONAL MINERALS & CHEMICAL CORPORATION • GENERA

New tonnage records show the way to profits in 1-1-1 RATIO FERTILIZERS



Popularity of 10-10-10, of 12-12-12 and higher-analysis, balanced fertilizers keeps climbing, as more and more farmers find their heavily-cropped soils pay off better with more N-P-K plant food. The saving on bag-lifting with the concentrated new products also helps them sell faster.

Tonnage of 10-10-10 in 1952-53 was only tenth among mixed fertilizers. By 1953-54 it had already jumped to fourth place. In this one year's time, tonnage of 1-1-1 ratio fertilizer (10-10-10 or better) increased from 490,000 tons to over 937,000 tons.

Are you set for this growing 1-1-1 market that puts more profit as well as more plant food in every ton you sell? You can make better quality, faster curing, dustless, free-flowing 1-1-1 mixed goods with ARCADIAN® Nitrogen Solutions and ARCADIAN Sulphate of Ammonia. These economical sources of nitrogen also give you desired nitrate and ammonia balance. For details, see a Nitrogen Division technical service representative. His services are available to customers at no cost.

Arcadian

PRODUCTS FOR PROFITABLE FARMING

Nitrogen Solutions (Nitrana® and Urana®)

Sulphate of Ammonia

American Nitrate of Soda

A-N-L® Nitrogen Fertilizer

Urea Products

NITROGEN DIVISION Allied Chemical & Dye Corporation

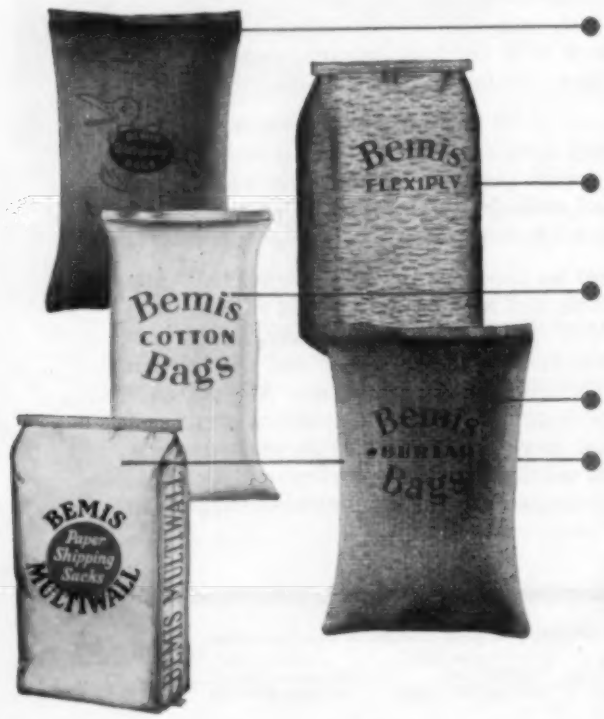
New York 6, N. Y. • Ironton, Ohio • Omaha 7, Neb.
Atlanta 3, Ga. • Hopewell, Va. • Indianapolis 20, Ind.
Columbia 1, S. C. • San Francisco 3, Cal. • Los Angeles 15, Cal.

NITROGEN DIVISION ALLIED CHEMICAL

from A to Z

ammonium nitrate — *zinc sulfate*

fertilizers and ingredients travel economically in Bemis Bags



Which types of Bemis Bags? Here's a good yardstick . . .

Bemis Waterproof (laminated-textile) Bags if you have a really hard-to-pack fertilizer or fertilizer ingredient—one that requires special protection against moisture gain or loss, escape of odors, loss from snagging or tearing. This is the strongest shipping bag made—particularly suitable for export.

Bemis Flexiply Bags if you need a little less than the super-protection of Bemis Waterproof Bags. These laminated, all-crinkled paper bags are tough, shock-resistant, flexible . . . handle and stack easily.

Bemis Cotton Bags if you want a sturdy, attractive bag with sales appeal and top-brand reproduction. Bemis Cotton Bags, white or dress print, are popular for their secondary household uses.

Bemis Burlap Bags if you are after maximum mileage . . . durable and economical.

Bemis Multiwalls if you want quality paper bags with the best multicolor brand printing in the bag business.

Bemis

408 Pine St., Box 66
St. Louis 2, Missouri

Here's another way LION IS HELPING YOU sell more Nitrogen Fertilizer

Impressive, Big-Space Advertisements are Appearing Month-After-Month in all These Publications

Lion's Chemical Sales Division is working to make sure you, as a fertilizer mixer, sell more fertilizers. One way we help is by consistent advertising to dealers and farmers. This advertising emphasizes how plant foods can best serve the farmer by increasing his profits.

We also offer One-Stop Service—which means you can contract for your nitrogen requirements from a single dependable source, saving you time (which, these days, is money!). As for *quality*, you can build your own reputation on a solid basis when you depend on Lion quality.

And when you need assistance with a formulation problem, our skilled Lion technical staff is ready to help you.

Our great storage facilities and the variety and flexibility of our manufacturing operations assure you of prompt shipment.

LION—A LEADER IN PETRO-CHEMICALS OFFERS:

Lion Anhydrous Ammonia—For formulation. A uniformly high-quality basic product. Nitrogen content, 82.2%.

Lion Aqua Ammonia—For formulation or acid oxidation. Ammonia content about 30%. Other grades to suit you.

Lion Ammonium Nitrate Fertilizer—For formulation or direct application. Improved spherical pellets. Guaranteed 33.5% nitrogen. Flows freely, spreads evenly.

Lion Nitrogen Fertilizer Solutions—For formulation. Three types to suit varying weather and manufacturing conditions.

Lion Sulphate of Ammonia—For formulation or direct application. Uniform, free-flowing crystals. Guaranteed to contain a minimum of 21% nitrogen.

DISTRICT SALES OFFICES:
NATIONAL BANK OF COMMERCE BUILDING, NEW ORLEANS, LOUISIANA • SHEPHERD BUILDING, MONTGOMERY, ALABAMA

WORLD'S LARGEST MANUFACTURER OF PRILLED AMMONIUM NITRATE

LION OIL COMPANY
CHEMICAL SALES DIVISION
EL DORADO, ARKANSAS

LION


if it can be bagged...
BAGPAK will bag it better!
International Paper

your eye tells you why

International's New Triple Superphosphate assures more

complete ammoniation

ONE look shows you why International's new Triple Superphosphate offers such a big advantage in ammoniation. Its improved fineness of texture; uniform, dust-free particles; and correct chemical structure assure maximum ammoniation in minimum time — help cut your manufacturing costs. International's new Triple Super is made by an improved process from high quality rock. Result: a high analysis product (46% A.P.A. or better). Special conditioning before shipment helps prevent setting up en route. This, plus improved particle size, means less grinding before mixing, more economical handling, better texture in your finished products and high product performance. International's new Triple Super is ready for immediate delivery to your plant. Write or wire the Phosphate Chemicals Division for samples and quotations.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

The Nation's Largest Producer of Phosphates • *General Offices: 20 North Wacker Drive, Chicago 6*

....the new outstanding fly killer

DIAZINON*

BAIT • WETTABLE POWDER • LIQUID

GEIGY DIAZINON, the most "talked about" insecticide of the year, is now available in the following formulations:

GEIGY DIAZINON FLY KILLER (1% granular bait)
GEIGY DIAZINON LIQUID KILLER (25% emulsion concentrate)
GEIGY DIAZINON 25W (25% wettable powder)

A development of the Geigy laboratories which originated DDT insecticides, DIAZINON has been widely acclaimed in the United States, Europe and Canada as one of the most outstanding fly killers since the advent of DDT insecticides. DIAZINON possesses quick killing ability and excellent residual properties, two essentials for effective fly control. In addition, it controls those strains resistant to chlorinated hydrocarbons.

GEIGY DIAZINON provides excellent control of flies and maggots under a variety of conditions. It may be applied in residual cover sprays, residual "spot" sprays, and in dry and liquid baits. Whether the existing problem involves maggot control in breeding areas around garbage dumps and trash piles or control of flies around porches, in livestock loafing sheds, calf barns, hog barns or other farm buildings, there is a specific GEIGY DIAZINON product for your particular needs.

- **98% reduction of flies each day of application of DIAZINON**
- **Relatively safe to humans and domestic animals.**
- **Flies begin to die within 10 to 20 minutes following application**
- **Effective against strains resistant to chlorinated hydrocarbons**
- **Versatility of use — may be applied in residual cover sprays, residual "spot" sprays, dry and liquid baits**
- **Residual action for 3 to 8 weeks**
- **Extremely economical — 1 lb. of GEIGY DIAZINON FLY KILLER treats 12,000 to 16,000 sq. ft. of floor area**

* "DIAZINON" is a registered trade mark of Geigy Chemical Corporation.

ORIGINATORS OF Geigy DDT INSECTICIDES

GEIGY AGRICULTURAL CHEMICALS
89 BARCLAY ST.

DIVISION OF GEIGY CHEMICAL CORP.
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JOB 1012

A Complete Integrated Fertilizer Plant

designed and now being constructed

by CHEMICO for

Escambia Bay Chemical Corporation

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to help America produce better crops

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CHEMICO

D. W. Aitken is the president and general manager of Midwestern Phosphate Corp., producers of Kickapoo Fertilizers.

Local and personalized fertilizer service is provided to farmers in west-central Wisconsin by the Kickapoo Fertilizers plant of the Midwestern Phosphate Corporation. Located in Hillsboro, Wisc., the plant directly services the small farmer with fertilizer, agricultural advice and assistance. The plant has an annual capacity of 15,000 tons.

Kickapoo Fertilizers

. . . Another Spensol User

Here is some of the modern equipment used by Spencer to produce SPENSOL Nitrogen Solutions for some of America's leading fertilizer mixers.

On time deliveries of SPENSOL solutions have helped to build Spencer's reputation for dependable service to mixers throughout the country.

New kind of solution injector, giving better ammoniation of mixed fertilizer, was invented by H. B. Davis of Spencer Chemical Company staff.

SPENCER

SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo. District Sales Offices: Atlanta, Ga.; Chicago, Ill.; Memphis, Tenn.; Works: Pittsburg, Kans.; Henderson, Ky.; Chicago, Ill.; Vicksburg, Miss.; Orange, Texas.

America's Growing Name in Chemicals

Now-a NEW Weed Killer-For Deep-Rooted Perennials

LOW-COST

DB* GRANULAR

NO MIXING... NO HAULING OF WATER

*TRADE-MARK OF BORAX CONSOLIDATED, LIMITED

DB GRANULAR CONTROLS THESE PERENNIAL WEEDS

Canada Thistle • Leafy Spurge
Toadflax • Bindweed (Morning Glory)
Whitetop • Russian Knapweed...
and many other perennial or annual herbaceous weeds on non-cropped agricultural land, along highways, railroad rights of way, parking lots, loading sites and similar areas.

CONTAINS 2,4-D...YET APPLIES DRY!

We fortified 2,4-D with Borates and doubled its effectiveness! This new weed-killing compound destroys *deep-rooted* weeds safely and efficiently. Contains 2,4-D yet applies DRY—without any mixing, water, or special equipment. Soil microorganisms which normally cause early breakdown of 2,4-D are controlled by the borates in DB *Granular*. Thus the plant-destroying action is prolonged and made much more effective. As little as 1 lb. per 100 sq. ft. is effective—and you apply it DRY. Application is simple—just a man and a pail, or any mechanical spreader, will do the job. Seasonal rains add DB to soil solution for effective killing action in the roots—even the deepest! You'll like DB *Granular;* it's always ready for instant use! *Write today for new Service Bulletin #16W.*

CHECK THESE IMPORTANT FEATURES

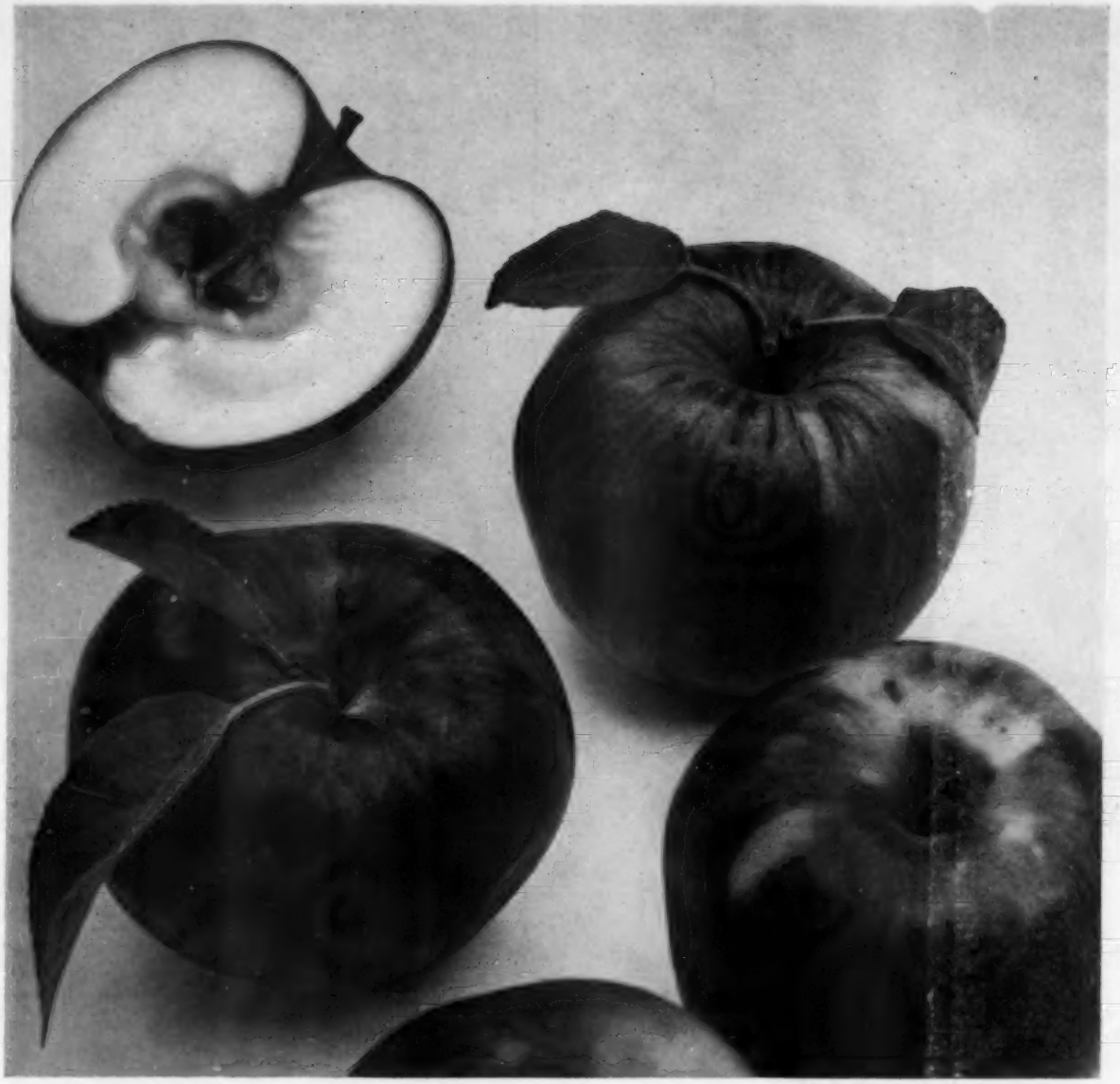
- DB GRANULAR IS ECONOMICAL TO USE
- DB GRANULAR IS DEPENDABLE IN ACTION
- APPLIED DRY—NO WATER—NO SPRAY RIG
- SAFE—NONFLAMMABLE—NONCORROSIVE
- LOW IN APPLICATION RATES—THRIFTY
- NONPOISONOUS WHEN USED AS DIRECTED
- EASY TO APPLY—JUST A MAN AND A PAIL

PACIFIC COAST BORAX CO.

DIVISION OF BORAX CONSOLIDATED, LIMITED

630 SHATTO PLACE • LOS ANGELES 5, CALIFORNIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS



SWEET PROFIT-MAKERS

Big, red, juicy apples are not grown by accident. The use of modern commercial fertilizers is a calculated investment to bring in a better crop—and a better income for the grower.

Potash, a major component of modern commercial fertilizers, improves crop quality as well as enriching the soil, building crop resistance to disease and increasing total product yield. USP's high-grade muriate of potash is free-flowing and non-caking—important advantages in the production of fertilizers that help make the sweet-tasting apple make sweet profits for the grower.

HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 60% K_2O MIN.

UNITED STATES POTASH COMPANY

INCORPORATED

30 Rockefeller Plaza, New York 20, N. Y.

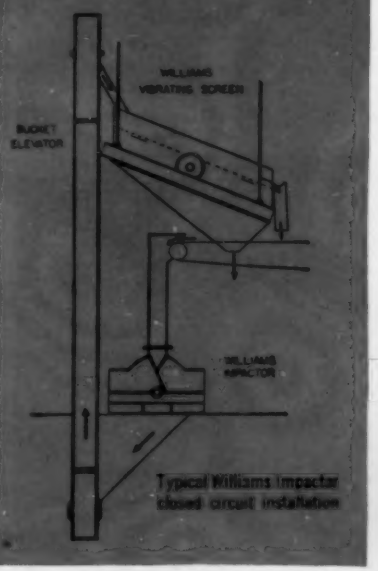
Southern Sales Office
Rhodes-Haverty Building, Atlanta, Georgia

REG. U. S. PAT. OFF

Lowest-Cost Crushing

with better product control

Open view showing hammers and impact blocks. Extremely rugged, heavy construction of steel plate with manganese steel liners, hammers and impact blocks. Extra large shafts are mounted in oversize bearings sealed in self aligning housings.



Typical Williams Impactor closed circuit installation

WILLIAMS *Reversible* IMPACTOR

By properly controlling the forces of speed and mass in size reduction operations, Williams Impactors offer the lowest possible cost-per-ton in producing top quality materials from 2" down to 35 mesh with a minimum of fines . . . or much smaller where more friable products are handled. In closed circuit systems with external vibrating screens, a single Impactor promises 100% product sizing with surprising economy, even with the most difficult specifications.

No grates are required, hence no replacement expense of these parts is necessary. Quick, uniform reduction, sizing and discharge from the mill eliminates any grinding attrition action that causes excessive wear, especially if raw materials are highly abrasive. Reversible rotation eliminates manual turning of hammers and minimizes down time. Impact blocks are also reversible which further reduces cost. Parts last up to 7 times longer than in other types of equipment. Unusually low maintenance is a feature of the Impactor.

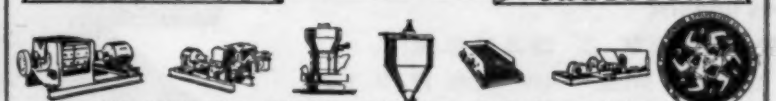
You have much to gain in lower costs and better product quality control with an Impactor. *Write for literature.*

WILLIAMS PATENT CRUSHER & PULVERIZER CO.

2707 N. Broadway **St. Louis 6, Mo.**

WILLIAMS

CRUSHERS GRINDERS SHREDDERS



Hammer Mills Helix-Seal Mills Roller Mills Air Separators Vibrating Screens Feeders

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

TRIPLE SUPERPHOSPHATE

1. RUN-OF-PILE FOR MAXIMUM AMMONIATION
2. GRANULAR FOR DIRECT APPLICATION
3. PROMPT SERVICE TO MEET EVERY REQUIREMENT

The source of superior phosphate fertilizers for nearly 30 years, U. S. Phosphoric Products is your ideal source for quality and dependability in Triple Superphosphate. Your Bradley & Baker sales representative will be glad to help you plan your shipments for maximum satisfaction. *Call upon him today.*

U.S. PHOSPHORIC PRODUCTS
Division TENNESSEE CORPORATION
Tampa, Florida

TC
TENNESSEE CORPORATION

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HOUSTON

Sell dairymen EXTRA MILK PRODUCTION *with* CRAG *fly repellent . . .*

It's a fact—cows protected from biting flies give as much as twenty per cent more milk every day! Show dairy farmers how to realize this extra profit, and increase your profits, too, by selling formulations based on CRAG Fly Repellent.

Flies cause lower milk production in three ways: they cause cows to use energy in fighting off flies; severe attacks drain up to three ounces of blood from a cow in a single day; cows lose valuable grazing time and take in less food while under fly attacks.

Earn more profits by selling dairymen protection for their cows—take advantage of this effective repellent.

CRAG Fly Repellent . . .

- *repels all biting flies that attack cattle.*
- *improves the performance of pyrethrins, allethrin, and methoxychlor.*
- *is chemically stable and non-corrosive.*
- *is a coupler and solvent for many insecticidal ingredients.*
- *can be used in a variety of formulations.*
- *is safe to use on cattle.*

Complete information on CRAG Fly Repellent for use on dairy or beef cattle is yours for the asking—just fill in and mail the coupon.

CRAG
Trade-Mark

AGRICULTURAL CHEMICALS

CARBIDE AND CARBON CHEMICALS COMPANY

A Division of
Union Carbide and Carbon Corporation
30 east 42nd Street New York 17, N. Y.

"Crag" is a registered trade-mark of Union Carbide and Carbon Corporation

CARBIDE AND CARBON CHEMICALS COMPANY
30 East 42nd Street, New York 17, N. Y.
Room 328, Dept. Y

Please send me technical information on:

- ☐ CRAG Fly Repellent
- ☐ Emulsifiable Concentrates
- ☐ Back-Rubber Concentrates
- ☐ Oil Sprays
- ☐ Pressurized Sprays

I am interested in formulations for:

- ☐ Dairy Cattle
- ☐ Beef Cattle

Name_____

Company_____

Address_____

HOUSTON


Mineralized FERTILIZER
THE Easy WAY WITH TC TENNESSEE CORPORATION
Custom Formulated
MINERAL MIXTURES
TC Custom-Formulated MINERAL MIXTURES
N-P-K
For a completely balanced plant food there's now only one additional ingredient to add — Tennessee's Custom-Formulated Mineral Mixtures — no additional labor or mixing facilities are required — we custom mix any combination of minerals to your own specifications — Tennessee's Custom-Formulated Mineral Mixtures come to your plant in bulk or bag already carefully mixed in controlled amounts of soluble, readily available forms of copper, manganese, iron, zinc, magnesium and boron — you reduce material cost handling time and number of items purchased with Tennessee's Custom-Formulated Mineral Mixtures.
Samples, specifications and detailed information upon request.
TENNESSEE TC CORPORATION
617-629 Grant Building, Atlanta, Ga.

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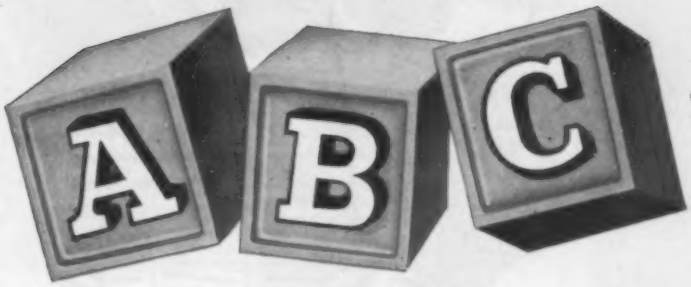
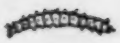



JAPANESE BEETLE


PEACH BORER

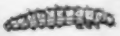

TOMATO FRUIT WORM


MEALY BUG


THRIPS


LACE BUG


PEAR PSYLLA


PINK BOLLWORM


PLUM CURCULIO


RED SPIDER


ROSE CHAFER


SHOT HOLE BORER


SPITTLE BUG


SQUASH BUG


STRAWBERRY WEEVIL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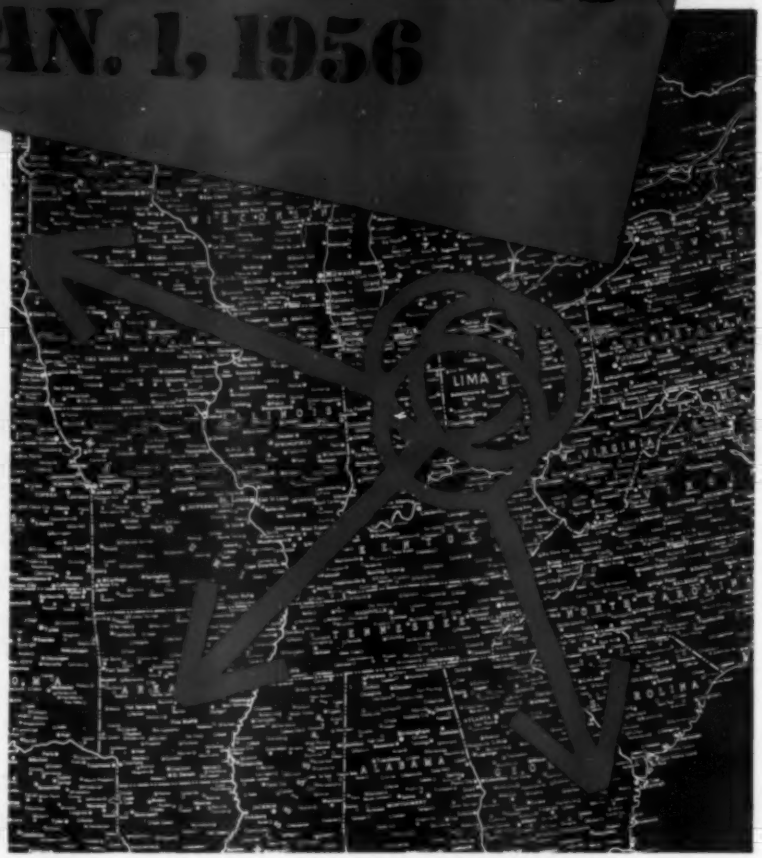

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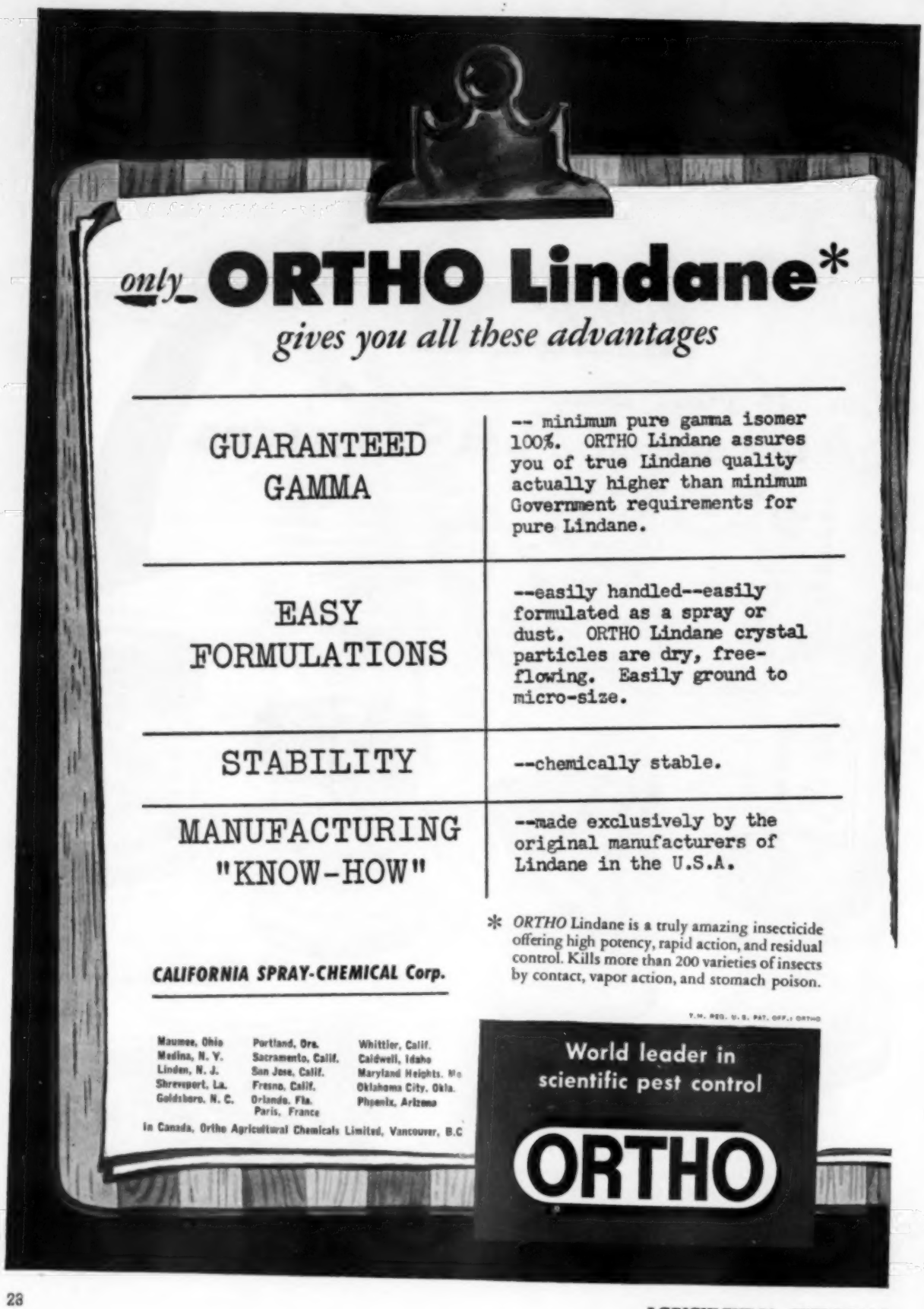
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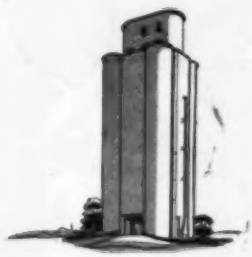
...**MOST ECONOMICALLY!** As much as 30,000 bushels per hour can be fumigated at an average cost as low as ¼-cent per bushel . . . less than any other method giving comparable results.



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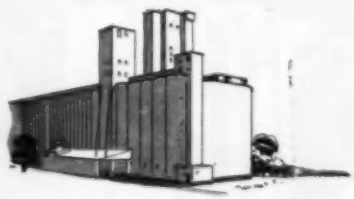

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Agricultural Chemical Research ... Key to Industry Expansion

By N. W. Allen

The Dow Chemical Co.
Midland, Michigan

President, National Agricultural Chemicals Association

IT is increasingly clear to the entire agricultural chemical industry that the retail dealer and, back of him, the distributor at wholesale are key people. They are important for many reasons. One is that they know how to use modern, powerful chemicals.

Selling these chemicals requires know-how. A farmer can see what an axe is good for by the way it looks. That is true of a great many tools. In the case of a chemical, its appearance has nothing to do with what a farmer may try to accomplish with it. Dealers have learned to expect farmers to ask questions and it is profitable to the alert dealer to be able to answer those questions correctly, or know where to go for correct information.

For the entire industry, from retailer to manufacturer, the year just past has been a year of very satisfactory volume. Prices have not by any means been so satisfactory. It has been more important than ever, in the past year, for retailers to step up their service and increase the assistance they can give farmers. In the long range view bigger and better service to customers means bigger and better business.

Much of the agricultural chemical industry gives support to this same philosophy. The industry is putting back a very substantial part of its income into research and development work to produce new and better chemicals and to find new and better uses for old ones.

It is expensive to develop new materials. It has been estimated that a single new agricultural chemical requires expenditure of approximately a million and a half dollars in research and development before it is ready for production and sales. This does not include the costs of a manufacturing plant and distribution costs.

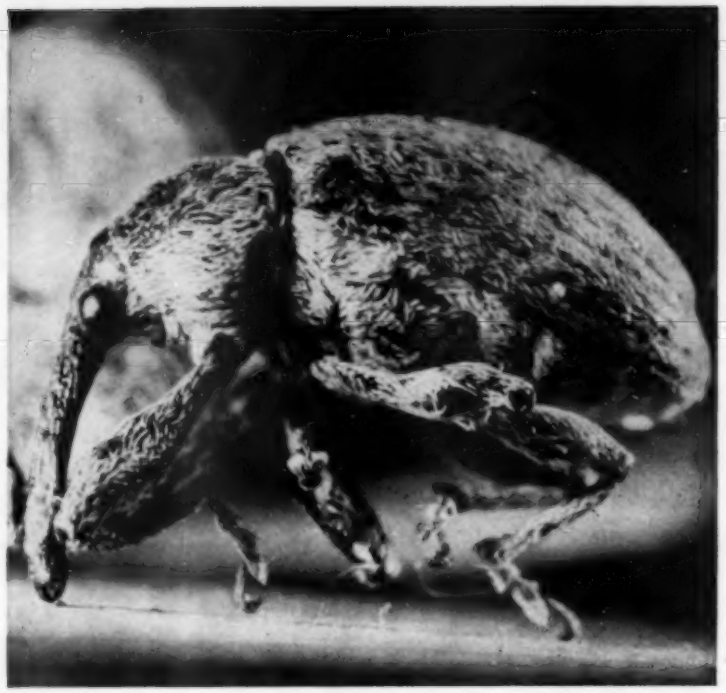
Of this large total, about a third—400,000 dollars in round numbers—is used for toxicology studies so that the chemical can be used safely. Before that kind of test is possible, it may have cost nearly a hundred thousand dollars to synthesize the compound in the first place, and to begin to find what it can be used for. After this it may cost almost a half million dollars more to try it out under field conditions throughout the country to determine exactly where, when, and how to use it.

Agricultural chemicals these days are so powerful and so effective that only the very best of the newer chemicals have a chance. I would estimate that more than a thousand new chemicals are rejected as perhaps "good" but not "good enough," for every one that ever eventually reaches the market.

Industry's investment in research is, in a sense, an investment in the future business of the retailer. He can be confident that the product he sells is backed up by

(*Continued on Page* 123)

TOXAPHENE SCORES AGAIN!



Still number one *insect enemy, the boll weevil returned to cotton fields this year with a vengeance. Hot, wet weather complicated the problem of boll weevil control. In many areas, damaging infestations built up rapidly.*

Still number one *boll weevil insecticide, toxaphene applied at regular recommended dosages controlled weevils quickly and thoroughly. Farmers who used toxaphene dusts or spray materials reported excellent control, prospects for a record cotton yield.*

TOXAPHENE dusts · sprays

THE CHEMICAL BASE FOR TOXAPHENE IS PRODUCED BY HERCULES FROM THE SOUTHERN PINE

For the first time in several seasons the Cotton Belt is experiencing a major outbreak of boll weevils. Late summer rains and high temperatures are ideal conditions for cotton production, but also provide a perfect climate for boll weevils.

With populations increasing rapidly, and with a bollworm outbreak threatening, experienced cotton farmers turned to toxaphene, both in dusts and spray formulations. Toxaphene, the insecticide that won acclaim as the outstanding boll weevil killer during the last major weevil infestation, is again proving its value. Results with toxaphene have been excellent. Farmers didn't have to double their dosages. Toxaphene did the job at the regular recommended rates.

Agricultural Chemicals Division,
Naval Stores Department
HERCULES POWDER COMPANY
970 Market Street, Wilmington 99, Delaware
Plants at Brunswick, Ga., Hattiesburg, Miss.
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NXSS-19

Editorial COMMENTS

THE pesticide industry has not yet had any real test of the new Miller residue law, because of the extension of effective date of the major part of the law beyond the end of this years' growing season, still general concensus in the industry, at least at this time, would seem to be that it is a good law, and that the delicate job of putting it into effect without upsetting the entire pattern of crop production has been well handled by the Food and Drug Administration.

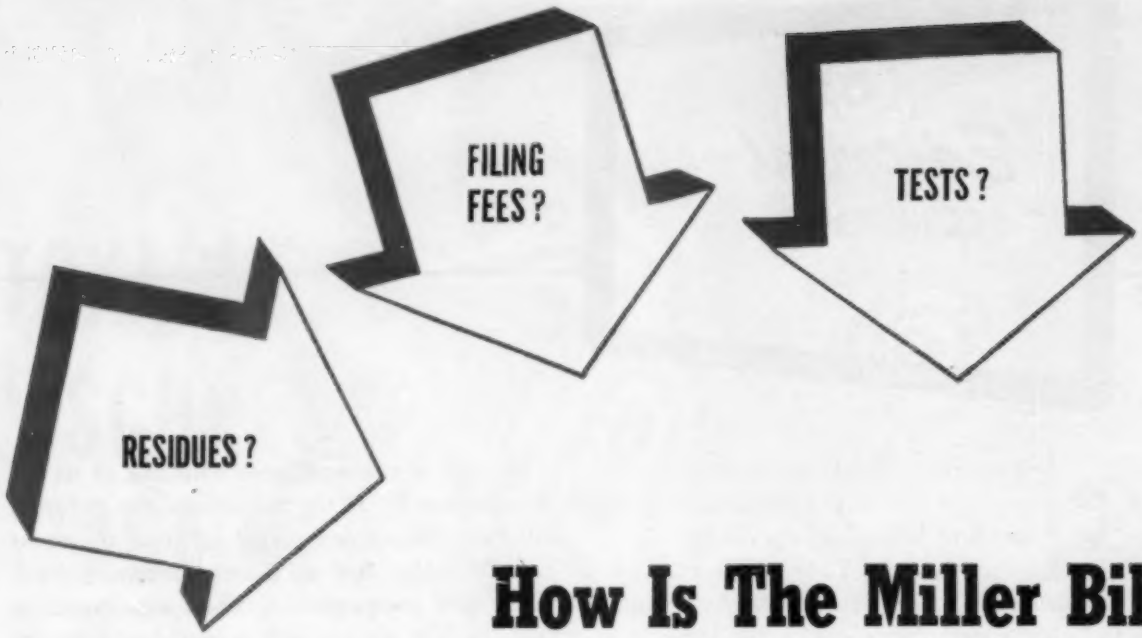
A few firms have had their problems in connection with application of the new controls, but Food and Drug seems to be going about the job of enforcement in an intelligent way, and with the realization that it would be completely demoralizing, particularly in the middle of a growing season, to arbitrarily tell farmers they must stop using the dependable and time tested chemical tools they have been using for years.

Real testing of the workability of the law will now of necessity be postponed until the 1956 season. But there is much to be done between now and then by insecticide manufacturers,—filing their petitions, accumulating the necessary toxicity data, following through on issuance of the tolerances or exemptions for their products so that they will be all ready for the new season. And, as pointed out elsewhere in this issue (see pg. 69) those who have the responsibility for making insect control recommendations have a big job to do too before next season rolls around. For they must be all prepared with a whole set of revised control recommendations, limited to accepted materials that can still be counted upon to do an effective control job.

Because of the intelligent handling of its responsibilities by FDA this season, the industry still has a lengthened period of grace to get its house in order. But we have a feeling this will be the final postponement. Those who expect to be selling the market next season should use the ensuing months fully.

IT had to happen eventually,—this season's better business, we mean. The old timers in the insecticide field have long been familiar with the fact that when you don't have bugs, you can't sell insecticides; but some of the comparative newcomers to the business could easily be pardoned if they have becomed discouraged over the past three seasons waiting for insect infestations and insecticide business to develop. Some of them, we might add, became real discouraged and stopped waiting, and were no longer around when the demand finally appeared.

It would be idle to say that big profits were made this season. Volume obviously was satisfactory, but sick price situations and questionable selling practices still must be remedied. However a year like this one can do a great deal to stiffen the price structure for next year. Buyers who were unable to get stocks of insecticides when needed over the past month or two are going to be much easier to handle when the 1956 contracting season rolls around in another few months. The shelves will be swept rather clean, and the pipe lines drained. If demand is as live next year as in 1955, maybe we can again sell insecticide in substantial volume,—and make some money doing it.



How Is The Miller Bill

PROBLEMS connected with the residue tolerance provisions of the new Miller pesticide law continued to confront manufacturers and users of pesticide chemicals as the current growing season draws to a close. The situation was eased somewhat by action of the Food and Drug Administration late in July in extending to October 31, 1955, the deadline when the residue tolerance provisions of the law become fully effective on a list of forty-six widely used pesticide chemicals. While this extension makes it possible for growers to continue use of the named materials through the balance of the 1955 growing season, pesticide manufacturers and growers alike are mindful of the fact that within another short two months period the problem of tolerances or exemption from tolerance requirements will again arise for those chemicals and uses that have not been cleared.

An exception to FDA's announced extension, permitting continued use of many materials through October 31, was noted in the case of Aramite, widely used miticide manufactured by the Naugatuck Division of United States Rubber Co., Naugatuck, Conn. The tolerance provisions of the Miller law were made effective on Aramite on August 5, (subsequently extended to September 15).

U. S. Rubber Co. had requested a residue tolerance of one part per million for use on the following crops: alfalfa, apples, blueberries, cantaloupe, celery, cucumbers, grapes, grapefruit, lemons, muskmelon, oranges, peaches, pears, plums, soybeans, sweet corn, tomatoes, watermelons, green beans, raspberries and strawberries.

FDA indicated that it was not prepared to give its approval to such a tolerance, because laboratory tests had shown that, at exaggeratedly high dosages, Aramite produced liver abnormalities in some test animals following life time feeding tests.

U. S. Rubber representatives pointed out in reply that the experimental findings in question occurred at residue levels many hundreds of times greater than would ever be encountered on foods; and that at the low residue tolerance requested there is ample evidence that Aramite can be used safely.

Because of inability to resolve the question on a basis of mutual agreement, FDA finally suggested appointment of a committee of experts, as provided for in the Miller law, to review available data and to give the Food and Drug Administration the benefit of its advice.

The National Research Council was asked to name the members of a five-man committee of scientists who are currently reviewing the case. The committee has until September 13th to report its opinion, unless it requests a further 30-day extension. After the Committee has reported, FDA will then take final action on the tolerance request. It is anticipated that the report of the committee will be released at that time.

The names of the five-man committee have not been made public. However, it is reported that both U. S. Rubber and the Government are pleased with the caliber of the men who accepted the assignment. An important point which it is reported they will investigate is the question of whether or not, at the lower dosage levels, tests on laboratory animals were without significant pharmacological effect.

The insecticide trade is waiting with much interest the outcome of this important and precedent-making case. First, it will serve as an initial test of this particular section of the law, and, in addition, pesticide formulators and users as well are much con-

Working Out In Practice . . . ?

cerned with seeing that Aramite gains a residue tolerance rating which will not seriously handicap its future use, as it has been widely accepted by the trade.

In a recent mailing to the trade, U. S. Rubber Co. called particular attention to the fact, overlooked by some, that the use of Aramite on non-food crops is not in question, the requested tolerance being meant to apply only to use of the product on food crops.

When asked by a representative of AGRICULTURAL CHEMICALS to comment on the matter, Winton B. Rankin, Assistant to the Commissioner of FDA agreed that the action thus far has the history-making effect of putting the law's technical machinery into operation. The delay, which will necessarily result, as a result of the question being referred to an advisory committee, he indicated, seems calculated to improve the possibility of a meeting of the scientific minds.

Both the U. S. Rubber Company and the Food and Drug Administration, he observed, made a major attempt to get together without the necessity of appointing a scientific committee. However, the Food & Drug Administration stuck to its position that consequences of the feeding of Aramite at high levels indicated possible use hazards which it was not prepared to risk. The Agency feels it does not have sufficient evidence from the consumption of Aramite at levels normally to be expected as residues.

Queried further on the broader and more general question as to how the Miller law is working out in actual practice, Mr. Rankin replied: "We're now primarily in the educational period. All interests covered by the scope of the Miller law have a tremendous job. In some respects, we're all feeling our way. Certainly these first six to nine months will develop operating experience so that at the end of this time we'll all know much better just what the law means and how it's going to operate."

How will this attitude affect the enforcement of the law? Mr. Rankin's answer was very positive that the law will be enforced and that Food & Drug will carry out its responsibility to protect public health. Problems of dangerous residues will be vigorously investigated. At the same time, Mr. Rankin expects the finding of health hazards to be the exception. A great deal of effort must be spent, however, in getting the machinery of the law into operation.

Industry Reluctant To Speak

IN an attempt to sound out industry opinion on operation of the Miller Law to date, AGRICULTURAL CHEMICALS found many top figures in the industry apparently reluctant to put themselves on record. Many spokesmen for insecticide companies were understandably unwilling to spell out and personally identify their views on, their problems connected with operation under the Miller law. As many of them have applications for tolerances pending, or perhaps will be filing such applications in the near future, they apparently share the feeling that they have no wish to be noisy complainers at this stage and perhaps invite unfavorable attention later. As one manufacturer points out, "We have been involved with several compounds to date, and feel that everything is going satisfactorily. However, we have not reached the point of having a tolerance placed on any of our materials, and we may run into unexpected difficulties that could change our viewpoint entirely. Should we encounter real difficulties later, I think we might be in a bad position were we now to make strong comments while we have petitions in the works. I don't believe that anyone who has a petition

under consideration would be inclined to make any strong public statement against the way the Food and Drug Administration is discharging its responsibilities under the new law."

This same individual adds that while his company has encountered a few misunderstandings and difficulties in its dealings with FDA, "such things are to be expected, I suppose. And in general FDA officials have been most helpful in clarifying some situations and we have been pleased with the attitude of the officials making the decisions there."

A representative example of the type problem that many in the industry are facing as they attempt to have their tolerance petitions acted upon is cited by another writer. They filed a tolerance petition, paying the required $500 fee. Toxicological data had previously been submitted in considerable detail, and they had gained the impression from Food and Drug that in their petition it would be in order simply to refer to this data. FDA came back with a request for this data in another form as part of the petition, then when it was supplied charged a supplementary filing fee of $150.

One writer points to the considerable difficulty involved in filing on insecticides for use on livestock. Setting a tolerance for insecticide residues on meat, he indicates, is quite a problem. It involves decisions, yet unmade, as to how residues are to be calculated. Is the residue percentage to be set against the weight of the entire carcass? Such residues are, of course, differentially deposited in the various organs. How does one get a representative sample of an animal carcass? Is it correct to take a certain portion of muscle, another of fat, smaller percentages of heart, liver and other organs, or will the residue tolerance be figured against the highest percentage found in any particular type tissue? These are apparently still unanswered questions, and the attitude of Food and Drug on such technical points has not yet been made clear.

Another writer who makes the same request that he and his com-

Miller Law Tolerances and Effective Dates

THE first three tolerances set under the Miller Law procedure are as follows:

SES—Fruit or Vegetable	P.P.M. of SES
Asparagus	2
Peanuts, peanut hay, peanut hulls	6
Potatoes	6
Strawberries	2

HEPTACHLOR— 0.1 p.p.m.

In or on the following raw agricultural commodities:

Alfalfa	Onions
Beets (including sugar beets)	Peanuts (2)
Brussels Sprouts	Potatoes
Cabbage	Rutabagas (yellow turnips)
Cauliflower	without tops
Clover	Sugar cane
Corn	Sweet clover
Cotton	Sweetpotatoes
Grass, pasture and range	Turnips with tops
Kohlrabi	

CAPTAN 20 p.p.m.

In or on the following fruits and vegetables:

Apples	Pears
Apricots	Peppers
Cantaloups	Pineapple
Cherries	Plums
Cucumbers	Prunes
Eggplant	Pumpkin
Grapefruit	Quinces
Grapes	Strawberries
Lemons	Summer squash
Limes	Tangerines
Mangoes	Tomatoes
Nectarines	Watermelon
Oranges	Winter squash
Peaches	

The dates on which the Miller Law becomes fully effective on a number of chemicals have been extended as follows:

September 13, 1955—Aramite

October 31, 1955—Acrylonitrile, Aldrin, Benzene hexachloride, Butoxy polypropylene glycol, Calcium cyanamide, Calcium cyanide, Carbon bisulfide, Carbon tetrachloride, Captan, Chlordane, Chlorobenzilate, Chloropicrin, Copper carbonate, DDT, Dieldrin, Endrin, EPN, Cyanic acid, Karathane, Karmex DW, Karmex W, Lindane, Malathion, Ethylene dibromide, Ethylene dichloride, Ferbam, Heptachlor, Hydro-Maleic hydrazide, Maneb, Methoxychlor, Methyl bromide, Ovotran, Parathion, Phygon, Piperonyl butoxide, Potassium cyanate, Sodium orthophenylphenate tetrahydrate, Sulfoxide, Sulphenone, Systox, TDE, Toxaphene, Trichloroethane, Zineb, and Ziram.

The reason Captan and Heptachlor appear on both lists is that while tolerances have been set for these two chemicals, the Miller Law does not operate until the effective date for these chemicals on specific crops for each named by the Food & Drug Administration. In the case of Captan the Miller Law does not become effective until October 31st for the following: Apples, apricots, beans (green beans, lima beans, black-eyed peas), celery, cherries (sweet and sour), citrus fruits (grapefruit, lemons, limes, oranges, tangerines), collards, cucumbers, eggplant, grapes, lettuce, mangoes, melons (cantaloupes, watermelons), nectarines, peaches, pears, peas, peppers, pineapples, plums, potatoes, prunes, pumpkins, quinces, spinach, strawberries, summer squash, tomatoes, winter squash.

For heptachlor the list includes alfalfa, beets (including sugar beets), brussels sprouts, cabbage, cauliflower, clover, corn, cotton, kohlrabi, onions, pasture and range grass, peanuts, peas, sugarcane, sweet clover, sweetpotatoes, turnips.

pany not be identified expresses his overall opinion that the law will be workable. He indicates that the insecticide industry is doing everything possible to make it work, and is bending over backwards to try to give FDA officials the cooperation which will help make it work. He believes that FDA is still feeling its way along, uncertain as yet on many points as to just how they will interpret and enforce the new law. The one point where he believes change will have to come is in the provisions involving tolerances and exemptions on experimental test plantings.

"Much will depend," he predicts, "on what policy FDA develops on picking up and condemning treated crops. I have gained the impression from talks with FDA officials that if the farmer uses an accepted material, as directed by the manufacturer, he will not be prosecuted even should an excessive residue result on a treated crop. If, however, he uses unaccepted materials, not as directed, or on crops on which such materials are not permitted to be used, he can anticipate real trouble."

"I think before we get through," says another manufacturer, "the Miller bill is going to be good for the insecticide industry. When all the bugs are out of it, and we settle down to understanding the new law and how to live with it and under it, it isn't going to be so bad at all. It must be remembered that as yet we have had no real experience with the new measure. The extension gets us by the present season, so in effect no one has had any down-to-earth experience. We certainly have done a lot of work getting our house in order so we can live with the new law in the years ahead."

The same attitude is expressed by another writer who says, 'I think any expression now would be a little premature, and I for one would not want to make any printed comment on the subject at the present time. In my opinion it would be much more to the point to poll industry sentiment on the new law sometime in 1956 after Food and Drug has actually established some tolerances and we have had some experience with the new law after its provisions have been employed to carry a compound through to the establishment of a tolerance."

While some in the industry are having their troubles with the new Miller Law controls, the general feeling in the trade seems to be that, if some way can be found to modify the stringent provisions affecting experimental test work (See *Agricultural Chemicals*, July issue pgs. 53-54, and August, pg. 54) the new law is one which the industry can live with, and which could eventually turn out to be very helpful in the orderly development of new and better products and improved measures of control. And while nothing definite has been reported as yet on modification of the residue tolerance requirements, so far as they apply to new experimental materials under test, the word seems to have been passed out from Washington over the grapevine that this hardship situation which has given so much concern to experimental workers is recognized and will be dealt with on a realistic basis.

Calls New Controls "Very Beneficial"

HOWARD J. Grady, vice president, and regional manager—East of California Spray-Chemical Corporation, believes that, by and large, "The effect of the Miller Bill in practice will be very beneficial, not only to the pesticide Industry as a whole, but beneficial to the grower and consumer as well. However, it does pose a problem to the industry, the experimental station worker, and the grower, and a great deal more planning will be required by everyone well in advance.

"The entomologist and plant pathologist, as well as the horticulturist, will have to cooperate more closely, and can no longer go their separate ways individually, since the problem is much more complex than just controlling an insect, a plant disease, etc. A program will have to be developed for each crop in cooperation with the residue chemist, the horticulturist, the entomologist, and the plant pathologist. Each individual product in the program will have to be studied carefully as to the effect it will have on the overall end result.

"The old proverb 'an ounce of prevention is worth a pound of cure' has certainly always held true in the protection of the nation's food supply. Under the Miller Bill, it becomes of even greater importance and can make the grower a great deal more money, with a lower cost to the consumer. The day of waiting until an infestation develops and then trying to eradicate it as the last moment with heavy applications of pesticides has passed. Considering that these residues must be kept to a minimum at harvest time, the grower will have to plan in advance, using a sound tested complete control program under a preventative basis, so that the need will never arise to use more toxic compounds as harvest approaches. 'Little worms are killed easier than large ones' has a simile in such a spray program.

"Effective control of a first brood early in the growing season minimizes the chance of the same insect or disease running unchecked later in the growing period when possible heavy foliage, high temperatures, scattered heavy showers, and other factors, may give inferior results. It has been demonstrated rather conclusively, time and time again, that an application of an oil spray early in the growing season followed by two consecutive summer applications of some of the newer miticides effectively controlled resistant mites when summer applications of these miticides alone failed to hold down the mite population. By the same token, most effective control can be obtained by concentrating on the first broods of codling moth, red banded leaf roller, aphis, and red mite on apples, the newly hatched tobacco hornworm on tobacco, spittlebug nymphs on alfalfa, the newly hatched nymphs of the mexican bean beetle on beans and the early control of cotton insects, etc.

"There was some criticism on the part of many people that the proposed effective date of July 22nd 1955 was going to place a hardship on many growers, due to the fact that this date fell in the middle of the growing

season. The Department of Public Health, Welfare and Education has done a great deal to remove this stumbling block by the establishment of various tolerances and postponing the effective date of other materials on which residues have not been finalized so that plans could be carried out to meet the problem.

"Biological screening and subsequent field evaluation of new pesticides has always been a dynamic phase of an agricultural chemical company. However, with resistance of various insects to various pesticides, research all across the board must be expanded enormously to meet the growers' demands for more effective pesticides on the basis of the product's individual toxicity and how it will affect an overall spray program. A great deal more research and education must be done by the research worker in full cooperation with his fellow research workers in other fields to fit them into an overall planned program.

"The Industry as a whole is going to have to spend a great deal more money doing research and toxicology work, not only on any new pesticides, but in the combinations with other materials. This can only result in better products with greater sales appeal to sell to the consumer, with a higher price for an improved product and increased benefits to everyone concerned.

"Even with the added cost of this additional research, the Miller Bill will help the agricultural chemical industry. It will bring all research workers closer together, since it is no longer an individual problem, thus eliminating some of the confusion that has existed in the past, which has caused some faulty results and strained public relations. From this research and cooperation will come planned programs for each crop in advance, so that it should no longer be necessary for any grower to have to rely on stop gap measures that could get him into trouble as the harvest season approaches. Thus, the Miller Bill will actually raise the reputation of the entire industry, give the farmer higher yields with less likelihood of failures, and in general stabilize the entire industry with a resultant lower cost to the ultimate consumer and greater profit for all."

"Eminently Successful," Says Decker

THE opinion that the Miller Amendment has been eminently successful . . . will prove to be thoroughly practical and of real value to all sections of American agriculture is shared by Dr. George C. Decker, Illinois Natural History Survey, and president of the Entomological Society of America, who says in commenting on the new law in operation:

"The Miller Bill (Public Law 518) which is in reality an amendment (Sec. 408) to the existing Food, Drug and Cosmetic Act came into being so recently that it would seem highly presumptive for any one to attempt passing judgment on its practical application at this time. With a properly tuned ear one can get a very wide range of comments and opinions ranging from unrestrained praise to utter condemnation, but none seem to have the true ring or tone of authority. Before attempting to pass judgment on this new law one should recall that it represents only one segment of the over-all problem of chemicals in foods, which in turn is only one segment of a world-wide movement to establish more rigid safeguards that will assure a safe, wholesome and adequate food supply.

"The unmistakable sound of wailing and gnashing of teeth have become audible as certain individuals, a bit slow in recognizing the full import of inevitable trends, came face to face with the Miller Bill, but so far such demonstrations have been relatively few in number and of short duration. With a little reflection even those who cried loudest have come to recognize that Section 408 imposes few if any restrictions or obligations that were not already inherent (stated or implied) in the Food, Drug and Cosmetic Act of 1938. The plain facts are that the Miller Bill represented an attempt to simplify and more clearly define many pertinent provisions of the older act. The final draft of the Bill approved by the Congress was thoroughly reviewed by all interested agencies—the Food and Drug Administration, agriculture, and industry—and was quite generally recognized as the best attainable compromise among widely divergent viewpoints. In fact, the provisions of the Act have much in common with the Basic Principles statements prepared by the Food Protection Committee of the National Research Council. Insinuations or claims that the Miller Bill in itself imposed many new restrictions and/or arbitrary requirements that impose undue hardships and injustices are for the most part unfair. Some have failed to recognize that for understandable reasons the Food, Drug and Cosmetics Act, as it pertained to pesticides at least, had never been fully implemented and enforced. The potentialities of this Act were first clearly demonstrated in the prolonged and expensive hearings conducted in 1950. Then too the U. S. Department of Agriculture had set up rather rigid safety requirements as prerequisites to the registration of a new pesticide and the acceptance of proposed labels. Unfortunately some critics apparently fail to recognize or admit that some new legislation would inevitably follow conclusion of the hearings conducted by the Delaney Committee and that the alternate proposals were far more drastic, ambiguous, and unworkable than the so-called Miller Bill.

"On the surface it would appear that the Miller amendment (Sec. 408) modifies and in a sense almost reverses some of the philosophies of the original Food, Drug and Cosmetics Act in that a certification of usefulness by the Secretary of Agriculture is substituted for the demonstration of necessity or unavoidability, and the burden of establishing safety is placed squarely on the shoulders of the manufacturer of the chemical or applicant for a tolerance, whereas in the past, by implication, the Food and Drug Administration was required to establish the existence of a hazard or at least a reasonably strong doubt as to safety. These changes, however, are

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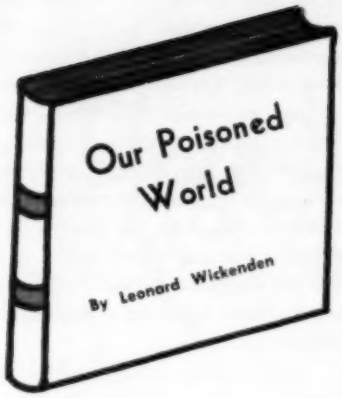

Insecticides on The "Pan" Again in New Book By Organic Gardening Devotee

WE have long had the feeling, perhaps expressed previously in these pages, that there seems to be much more glamour, and profit as well, in writing about organic gardening than in the actual practice of the art. Followers of other fads and cults like yoga, channel-swimming, flag-pole-sitting, gold-fish-swallowing, etc. are normally content merely to put their theories into practice, but the organic gardeners are much more vocal. They insist on getting their theories into print, and urging one and all to become organic gardeners and to shun chemical fertilizers and pesticides.

The father of the movement is Sir Albert Howard, but the most prolific writer on the subject in the United States has long been Louis Bromfield, whose Malabar Farm in Ohio has served as the staging area for a whole series of books on the glories of organic gardening. It would probably be quite safe to say that Mr. Bromfield has produced many more copies of his books than he has rutabagas or cabbages.

Latest in the list of prolific writers on the subject is Leonard Wickenden of Weston, Connecticut. Mr. Wickenden has produced two earlier books, "Gardening With Nature" and "Make Friends With Your Land." He is now engaged in the completion of a third volume shortly to be published by Devin-Adair Co. of New York who do quite a business with the Garden Guild Book Club and also publish a number of volumes on Irish poetry.

It took some time to decide upon just the right title for Mr. Wickenden's latest opus. First under consideration were "Your Daily Poison" or "Our Poisoned World." Finally the publishers decided upon "The Public Be Poisoned." The title alone should be adequate to let insecticide manufacturers know what to expect from Mr. Wickenden's forthcoming volume, but if it does not give ample advance warning, it should suffice to add that there will be a preface to the book contributed by that well known medical figure, Dr. Morton Biskind, who has probably diagnosed more cases of DDT poisoning in his practice than has any other doctor in the country.

Describing their new book, the publishers say "The author of this sensational book sets out to discover to what degree the mania for using poisons in our daily lives is endangering our national health. He has combed thousands of pages of government bulletins, medical and scientific journals and finds the situation much more frightening than he had expected. He has condensed the evidence into a forthcoming book which tells the truth about a most shocking situation."

Mr. Wickenden, whom Devin-Adair refer to as a "noted chemist," is a very charming gentleman who is quite obviously a sincere and honest believer in the basic theories of organic gardening. British by birth, he attended the City and Guilds of London Central Technical College, graduating in 1906, following this by a course in food chemistry at Tunbridge Wells Technical Institute. He later came to the United States and worked for a number of years with West Virginia Pulp and Paper Company as the head of their analytical and research laboratory. Subsequently, he was vice president of Suchar Process Corp., a subsidiary of WV P&P. He relinquished this position about ten years ago, and then operated a consulting business in New York City until his retirement some three years ago. His work in the chemical field was almost exclusively in the field of paper chemistry and sugar chemistry. He was never directly connected with any work in the fertilizer or insecticide field, and his pursuit of gardening has been an avocation, as it is for so many others.

Mr. Wickenden is a devoted disciple of Sir Albert Howard. In an interview granted to a representative of AGRICULTURAL CHEMICALS early last month, he indicated his firm belief that when organic gardening principles are followed, and the organic content of the soil built up, it soon becomes possible to grow vegetables which are so vigorous and healthy that they become practically immune to pests and disease. He doesn't go so far as to say that the pests and disease disappear entirely, for he has the direct evidence of his own eyes in his garden where an occasional tomato leaf worm or Japanese beetle has the impudence to invade even a well-kept organic garden. As a matter of fact, the day Mr. Wickenden and I looked over his plot, it seemed quite obvious that Japanese beetles had

dined rather heavily on the leaves of the raspberry bushes. However, Mr. Wickenden indicated that there was nothing to be done,—that the pesky beetles were "foreign invaders," with no natural predators in the U. S., and that in any case the berries had been completely unaffected.

He was raising a beautiful crop of tomatoes, which indeed seemed very healthy and delicious as well, but of course the size of the garden was such that it would have been a simple matter to pick off any pests individually, which method of handling the problem is of course not practical for commercial farmers whose crops may cover thousands of acres.

Mr. Wickenden's belief is that pests and diseases have a purpose in this world, as does everything else in the great overall plan. Nature in its abundance grows far too much of everything, he points out, and pests and diseases have the role of executioners,—being put here to destroy the weaker plants and thus help propagate healthier and continually improving strains. We were unable in our brief inspection of his garden, however, to find that the Jap beetles had exercised any critical powers of selection. As I saw it, they ate right and left, chewing up the healthy leaves as well as the subnormal foliage.

Mr. Wickenden indicated that while he had no specific training or direct experience in the field of insecticide or fertilizer chemistry and had conducted no actual research in these fields, he had learned a great deal on the subject from his long experience as a backyard gardener. He pointed out that his own experience convinces him of the superiority of the natural method of growing vegetables, fruits and flowers, and the disastrous results to be anticipated from use of poison sprays. He pointed out the usual arguments to the effect that insecticides kill off many of the natural predators, that spraying schedules get to be more lengthy and complex each year, and that insects rather rapidly develop resistance to one insecticide after another.

The only insecticide he said he ever uses is an occasional spraying with "Black Leaf 40" to control aphids in his greenhouse. However, he excused himself on this point, since growing in a greenhouse is unnatural, in any case, and might logically involve unnatural methods of pest control.

DR. Biskind who is doing the introduction to the new Wickenden volume is a neighbor of the Wickendens. Your *AC* reporter also talked to Dr. Biskind, who supplied us with a reprint of an article, "Public Health Aspects of the New Insecticides," reprinted from the November 1953 issue of the *American Journal of Digestive Diseases*, which he indicated summarizes his position on the danger of insecticide use. It is his belief that there has been a great increase in many diseases of animals and men in the past ten years which he ascribes to the wide use of the chlorinated hydrocarbon insecticides. He refers to polio, hepatitis, virus diseases, and hyperkeratosis (or X disease). In his practice, he indicates that he has diagnosed DDT poisoning in hundreds of cases. In this role of diagnostician of DDT poisoning he seems to be supreme, for most doctors do not seem to share his strongly-held belief that DDT and other chlorinated hydrocarbon insecticides are responsible for heart trouble, polio, hepatitis etc. as Dr. Biskind charges.

In the article referred to above, Dr. Biskind makes the interesting observation that "as many workers have now shown, by maintaining proper fertility of the soil, it is possible without the use of insecticides, to raise crops showing little or no damage from insects." Here we trace again the familiar course from hostility toward insecticides back to organic gardening. Several references are cited by Dr. Biskind to support this claim that properly nurtured crops shed insects and diseases like water off a duck's back.

We checked the references immediately, thinking that perhaps there might be some actual informed evidence to support this popular belief shared widely by organic gardeners. However the two authorities cited by Dr. Biskind turned out, not really to our great surprise, to be our old friends, Louis Bromfield and Leonard Wickenden. Perhaps we are skeptical, but we would prefer the actual evidence of some extensive work in test plots by agricultural experiment stations, rather than the unsupported claims of these two prophets of the organic gardening school whose gardens are essentially hobbies and never intended to be operated as commercial ventures.

To get what facts might be obtainable supporting Dr. Biskind's views, and to check further on his qualifications as an expert in the field of insecticide chemistry and insecticide poisoning, the following letter was dispatched to him.

Dear Dr. Biskind:

Thanks for sending me the reprint of your article "Public Health Aspects of the New Insecticides." I have read it with considerable interest, although I must add, also with some scepticism. It is a common error in reasoning to assume a causal relationship between events which may actually be related only in time. Thus you seem to assume that because some of the newer insecticides were introduced at about the same time you report increased incidence of certain diseases, there must necessarily be a causal relationship. Such a time relationship is basis for a hypothesis, to be sure, but the hypothesis must then be proved true. And this demands facts, not just opinions.

I might say with just as much reason that these diseases which you cite were caused by the atomic bomb, flying saucers, or a change in the cycle of sunspots—any of which might be shown to exhibit relationship.

What we are trying to do in our proposed article in AGRICULTURAL CHEMICALS is to tell our readers what "facts" there are on which your opinions are based. And we are attempting, too, to assess the qualifications of some of the various writers on insecticide subjects, for obviously an opinion is rather meaningless if it comes from some one without the training or experience to qualify him as an expert in the field.

In your own case, you are of course a medical doctor, and your opinion, for this reason, must carry weight. Will you oblige us by telling us where and when you studied medicine, also of what professional societies you are a member, and whether or not you are now or have been an officer of any of these groups.

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Urea Nitrogen AND SANDY SOILS

By

By Gaylord M. Volk
Florida Agricultural Experiment Station

THE current increases in the use of urea and certain other nitrogen carriers are introducing some special problems for sandy Florida soils. Urea has much in common with ammoniacal nitrogen as a fertilizer constituent, because of the rapid conversion of urea to ammonia in the soil; yet it does have characteristics that need special study. During its period of existence as urea, the nitrogen is quite mobile. Heavy rains following immediately after application may cause considerable leaching, although there is evidence that some retardation of leaching of urea by the soil may exist (1, 2). On the other hand, when urea is converted to ammonia it is readily absorbed by the base exchange complex of the soil and leaching loss is relatively low even in strongly acid soils. Mobility of ammonia as a neutral salt such as ammonium sulfate or amonium nitrate is relatively high in strongly acid sands (3).

The conversion of urea to ammonia is thought to be the result of the combined effect of the enzyme, urease, accumulated in the soil and the activity of microorganisms. Recent investigations with sandy Florida soils indicate that urea is converted to ammonia at rates varying from 5 to 35 p.p.m.* of urea nitrogen for the first hour, and from 20 p.p.m. to over 60 p.p.m. in 22 hours (2). The lowest rates of conversion were associated with citrus soils containing appreciable amounts of residual copper**, while intermediate rates were found for certain subsoils and virgin soils.

The relatively low activity of subsoils and virgin soils is assumed to be the result of a low level of enzyme accumulation and low microbiological activity. The low activity of the citrus soils containing copper appears to be associated with a definite inhibitor of urease. Addition of moderate amounts of urease to these soils or to extracts of them did not give a proportionate increase in the rate of conversion of urea to ammonia. Copper is known to be an inhibitor of the enzyme.

Another factor which must be considered when evaluating water-soluble nitrogen is the rate of diffusion that takes place without actual water movement. Urea penetrates the soil from surface application or moves from its point of placement in a fertilizer band by this process during the period of time prior to its conversion to ammonia. The quantitative diffusion of urea nitrogen was found to average 3 to 4 times that of ammonia nitrogen from ammonium carbonate when added to moist sandy soils, but it did not exceed a diffusion distance of 2 inches from the zone of placement. The diffusion of urea would reduce the concentration at the point of placement and increase the rate of conversion to ammonia, but otherwise is not a factor of major importance.

*This would approximate 20 to 140 pounds of urea per acre mixed to plow depth. Increasing the concentration of urea by surface application or banding would reduce the relative conversion rate per acre, and allow greater opportunity for leaching.

**Soil samples and copper analyses for these soils were supplied by Dr. I. W. Wander, Citrus Experiment Station, Lake Alfred, Florida.

Florida Agricultural Experiment Station Journal Series, No. 401.

Nitrogen Sources for Pasture Grasses

THIS study was conducted in lysimeters approximately 22 square feet in area and 4 feet deep, equipped to catch subsoil drainage for analysis. They were filled with Lakeland fine sand, a type of soil widely used for citrus and general crops in Peninsular Florida. The subsoil and the surface 10 inches were added separately when the lysimeters were filled in January of 1950. Various grasses were planted and allowed one year to become established under uniform light fertilization before the tests were started.

Table 1 shows the yield and composition of the grasses and the percentage recovery of nitrogen in the harvested grasses and drainage waters, where three 20-pound applications of nitrogen were made in one season.

There was no apparent difference between ammonium nitrate, urea, and nitrate of soda in effect on yield or composition of vegetation, or on leaching loss of nitrogen for a given grass.

Movement of 10 to 13 inches of water through the lysimeters produced only negligible loss of nitrogen. Approximately 8 inches of water passed through the lysimeters after the last addition of nitrogen on July 10. Previous tests with these lysimeters have shown that passage of this amount of water will effect almost complete removal of the readily soluble constituents of a given application of fertilizer (4).

Table 2 shows the effect of 8 monthly applications of 60 or 30 pounds of nitrogen on the yield and composition of 4 grasses in the lysimeters. Rainfall was such that leaching was negligible, and the lysimeters had to be leached artificially at the end of the harvest period to measure the soluble nitrogen.

There was no consistent difference in yield, percentage nitrogen, or recovery of nitrogen between the 480 pounds of nitrogen from ammonium nitrate and urea. The recovery of nitrogen by carpet grass was very low, and 16.9 percent of the application of 480 pounds of nitrogen was removed by leaching, but there was no difference attributable to source.

Table 3 shows data for the same grasses the following year in which the monthly rates of application remained the same, but only 6 applications were made instead of 8. Rainfall was such that natural leaching was significant and removed appreciable quantities of nitrogen from the lysimeters. No differences due to sources of nitrogen were apparent. A deficiency of phosphorus was suspected as being a factor limiting growth of the Pangola grass.

TABLE 1

Yields of Pasture Grasses and Leaching Losses With Various Nitrogen Sources, 1951.

Nitrogen Source	Tons Dry Weight Yield per Acre	% N	% of N Application in Harvest	Inches of Water Leached	% of N Application Leached
	Pensacola Bahia Grass				
Urea	2.05	1.08	74	10.9	Trace
Ammonium Nitrate	2.18	1.11	81	11.7	Trace
Nitrate of Soda	2.18	1.07	79	10.3	Trace
	Pangola Grass				
Urea	2.26	0.81	61	13.1	Trace
Ammonium Nitrate	2.09	0.82	58	12.7	Trace
Nitrate of Soda	2.51	0.79	66	13.2	Trace
	Carpet Grass				
Urea	1.61	1.08	58	13.3	0.9
Ammonium Nitrate	1.46	1.13	55	12.6	1.7
Nitrate of Soda	1.64	1.05	57	12.8	0.6

All received 20 pounds N per acre on 3/7, 5/11, 7/10 as indicated except calcium nitrate substituted for sodium nitrate on 5/11, 7/10.
120 pounds K_2O and 120 pounds P_2O_5 applied 3/7.
Grasses cut 5/19, 7/6, 8/17, 10/11.

TABLE 2

Effect of Nitrogen Source and Quantity on Yield of Pasture Grasses, 1952.

Pounds N and Source	Tons Dry Weight Yield per Acre	% N	% of N Application in Harvest	% of N Application Leached
	Pensacola Bahia Grass			
480 Urea	6.3	1.77	47	0.1
480 Ammonium Nitrate	6.6	1.74	48	0.4
240 Ammonium Nitrate	4.6	1.30	50	0.1
	Pangola Grass			
480 Urea	7.6	1.72	54	1.5
480 Ammonium Nitrate	7.7	1.74	56	1.6
240 Ammonium Nitrate	5.9	1.18	58	1.1
	Carpet Grass			
480 Urea	3.6	1.90	28	16.9
480 Ammonium Nitrate	3.6	1.79	27	16.9
240 Ammonium Nitrate	2.5	1.42	30	5.1
	Coastal Bermuda Grass			
480 Urea	6.6	2.12	58	1.2
480 Ammonium Nitrate	7.6	1.78	57	2.9
240 Ammonium Nitrate	4.2	1.23	43	1.0

Nitrogen was applied the first of each month at 60 or 30 pounds for 8 months beginning in March. Thirty pounds each of P_2O_5 and K_2O were applied each month. Grasses were cut monthly before fertilization.
Rainfall was unusually uniform for the growing period and natural leaching was negligible. Lysimeters were leached artificially at the end of the above period to obtain residual soluble nitrogen.

Effect on Surface and Subsoil Acidity

At the conclusion of the preceding tests the soils in the lysimeters were sampled to determine the effect of various treatments on soil acidity. Data appearing in Table 4 shows that the soils were more acid in the surface 10 inches, and less acid in the 10 to 18 inch subsoil than they had been at these depths when the lyimeters were filled in 1950. Where the heavy application of ammonium nitrate had been used for two years, the surface soil was more acid than where urea had been used at the same rate. There was a general decrease in acidity of the 10 to 18 inch subsoil with all treatments, but the soil was consistently less acid where urea had been used than where ammonium nitrate was the source.

The relative effects of urea and ammonium nitrate on subsoil acidity indicated that urea converted to ammonia and no significant leaching took place. The amomnia was largely held in the surface soil until utilized or converted to the nitrate form. The

(*Continued on Page* 133)

Some stability, compatibility and technological findings on

MALATHION

AND ITS

FORMULATIONS

By J. F. Yost, I. B. Frederick and V. Migrdichian

American Cyanamid Co., New York

THE organic phosphate S-(1,2-dicarbethoxyethyl)0,0 - dimethyl dithiophosphate (1) (2), commonly called malathion, is finding utility as an insecticide in widely diversified fields. Label claims for malathion have been accepted by the U.S.D.A. on over 75 different insects. Aphids, spider mites, scales, houseflies, and various other chewing and sucking insects attacking over 40 different fruit and vegetable crops, as well as ornamentals and animals, can be controlled adequately and economically with low dosages of the compound.

Organic phosphate insecticides are a class of materials characterized by high insecticidal activity, high anticholinesterase, and high mammalian toxicity. Malathion, while possessing high insecticidal properties, produces only a weak inhibition of tissue cholinesterase. The LD_{50} acute oral toxicity of 95% malathion technical, current commercial product, against male albino rats is over 2100 mg./kg. of body weight. Highly purified malathion is even less toxic to mammals. Oral, dermal, vapor, and chronic toxicity studies and practical usage have shown that malathion technical is one of the safest insecticides now commercially available.

PART I

In addition, malathion has a moderately high vapor pressure compared with other commercial insecticides, and is found to disappear almost completely from fruit and foliage within a week or ten days after a normal spray application, thus either eliminating or greatly minimizing troublesome insecticide residue problems. By use of higher initial dosages and certain formulation adjuvants such as sugar or highly chlorinated aromatic hydrocarbons, residual activity can be increased, if desired. Malathion, when properly formulated, is relatively nonphytotoxic and is well tolerated by most ornamentals, fruit and vegetable crops. No significant off-flavor tastes were found when the insecticide was properly used on edible crops.

This unique combination of factors, high insecticidal activity, low order of mammalian toxicity, low order of phytotoxicity and lack of any pronounced residue or off-flavor problems, makes malathion a most useful insecticidal chemical for pest control. Its scope of applicability includes not only those insects common to fruits, vegetables, and ornamentals, but also flies, mosquitoes, general household pests, animal and poultry ectoparasites and stored grain insects.

General Technical Data

PURE malathion is a colorless, slightly viscous, high boiling liquid possessing an ester-like odor. It has a b.p. of 156-157°C at 0.7 mm with slight decomposition; m.p. of 2.85°C, and refractive index of nD^{25} 1.4985. The commercially available product, 95% grade or better, has similar physical characteristics. It is a brown to yellow liquid with a characteristic mercaptan-like odor. Work in progress has shown that odor characteristics can be improved both by better formulation and certain process changes.

Malathion is miscible in all proportions with many of the moderately polar solvents. Organic esters, ethers, alcohols, ketones, aromatic and halogenated hydrocarbons and vegetable oils are among the solvent types most useful as formulation extenders. Highly polar materials such as water and highly non-polar types such as aliphatic hydrocarbons are very poor solvents for malathion.

Chemically, malathion is a reasonably stable compound when properly stored. It is stable to light, but undergoes some decomposition when held at temperatures much exceeding room temperature. The compound and liquid formulations thereof decompose slightly with formation of a

solid gel when stored for prolonged periods in the presence of iron. No gelation occurs when held in glass or well-coated rezyl lined containers. The presence of moisture and strong acids may also induce chemical decomposition. Malathion is readily hydrolyzed in highly alkaline media, but is quite stable in neutral or even somewhat acidic media. When solubilized in water-alcohol or water-methyl cellosolve, almost instantaneous hydrolysis occurs at pH 12. At pH 9, 50% hydrolysis was observed in about 10 hours, while at pH 5-7 no hydrolysis was observed over a period of 12 days. Thus, while malathion is a reasonably stable compound under certain conditions, decomposition can be induced by a combination of factors such as moisture, pH and catalytic activity, especially in some formulations, as will be discussed subsequently.

Due to the wide scope of applications and general usefulness of malathion as a pesticide, many different types of formulations have been de-

TABLE I
Stability of Malathion Emulsifiable Concentrates

Formulation	Emulsifier and Source	% Malathion Initial	3 mo.	6 mo.	1 yr.	18 mo.	2 yrs.
90% malathion tech. 10% emulsifier	Triton X-155 Rohm and Haas Co.	81				78.1	
65% malathion tech. 35% emulsifier	Glycol S-1132 Glyco Prod's. Co.	61.5	58	58	56.0	—	54.4
60% malathion tech. 8% emulsifier 32% xylene	Triton X-155 Rohm and Haas Co.	55.5	54	—	55.1	—	
60% malathion tech. 8% emulsifier 32% xylene	Mal-20 Wm. Cooper & Nephews, Inc.	56.3	53.6	56.3	55.0	—	—
60% malathion tech. 8% emulsifier 32% xylene	Glyco S-1132 Glyco Prod's. Co.	51	—	47	—	47	—
60% malathion tech. 8% emulsifier 32% xylene	Atlas G-1256 Atlas Powder Co.	56.2	—	—	—	—	54.4
60% malathion tech. 8% emulsifier 32% xylene	Antarox A-200 Gen. Dyestuff Corp.	55.9	—	—	—	—	53.8
60% malathion tech. 8% emulsifier 32% xylene	Alrodyne 97 Alrose Chem. Co.	58.4	—	—	—	—	54.7
60% malathion tech. 8% emulsifier 32% xylene	Agrimul 25A Nopco Chem. Co.	57.3	—	—	—	—	53.9
60% malathion tech. 8% emulsifier 32% xylene	Cooper ATX-60 Wm. Cooper & Nephews, Inc.	56.3	—	—	—	—	52.9
60% malathion tech. 8% emulsifier 32% xylene	Triton B-1956 Rohm and Haas Co.	55.6	—	—	—	—	56.0
60% malathion tech. 8% emulsifier 32% xylene	Triton X-100 Rohm and Haas Co.	53.5	—	—	—	—	53.1
60% malathion tech. 8% emulsifier 32% xylene	Antarox B-201 Gen. Dyestuff Corp.	57.1	—	—	—	—	54.7

veloped. Compositions possessing both satisfactory physical characteristics and reasonable chemical stability have been prepared. Types investigated include wettable powders, dust concentrates, dilute dusts, granular preparations, emulsifiable liquid concentrates, liquids, specialized fly spray preparations, aerosols, oil mists and baits. Combinations with certain other insecticides, fungicides, and soluble fertilizers are also possible. During the course of these various developments a number of preparations were also made in which serious loss in grade of malathion was encountered during storage. Thus, the proper formulation of malathion to insure chemical stability during storage is one of the most important factors to be considered for its successful use and commercialization.

Malathion Stability

THE following discussions deal with somewhat detailed data on chemical stability and compatibility of malathion obtained during laboratory and field development, covering a five year period. During this time malathion technical was upgraded from an initial purity range of 70 to 80% to a guaranteed purity of 95% or better. Changes in nature and amount of impurities present varied correspondingly.

The analytical procedure known as the "Alcohol-Ferric Oxidation Method" (3), was used in all of the more recent work reported except in those compatibility studies where the formulation in question contained certain interfering and readily oxidizable materials. Their presence results in low values for malathion content and necessitates use of the longer "Carbon tetrachloride Method" (3) (4) which was developed originally for malathion residue studies. Both analytical procedures are empirical in nature and require good reagents and strict adherence to directions given. An experienced operator can obtain analytical results with a confidence of ±2% based on actual malathion content.

While analytical results obtained during the development of malathion are generally satisfactory, it is felt that any particular individual analytical result for a formulation should not be the deciding factor with respect to stability or instability thereof, but rather that the general trend or plot of a series of long-term stability test results should be considered.

Technical Malathion

VARIOUS grades of malathion technical as well as highly purified malathion were stored in glass or selected lined containers and held at room temperature for a 2 year period. No significant drop in grade of malathion was noted in any of the tests. Coated containers evaluated included Rheem's 970 lined drums, IC-25 lined drums, and 4A roller coated rezyl lined cans.

Several types of malathion emulsifiable liquid representing different batches and grades of malathion technical initially were stored at room temperature and analyzed periodically. Stability data obtained are recorded in Table I.

The data in Table I indicate that a loss in grade of 1 to 3% malathion occurs in emulsifiable concentrates during a two-year period of storage. Since in most cases only an initial and final rather than a series of analyses is available for a particular formulation, the results should not be interpreted too literally. The data do show that for most of the emulsifiable concentrates investigated, an overage of about 2% malathion is desirable for formulations expected to meet guarantees after prolonged storage. Most of the emulsifiers investigated for use with malathion are non-ionic materials. Recent and incomplete work has indicated that malathion may have poor shelf-life when formulated with certain anionic-nonionic emulsifier blends.

Stability studies were made with malathion emulsifiable concentrates containing moisture or acidic and basic materials. Tests were carried out using a formulation prepared with highly purified 99%+ malathion and specially dried Glyco Products S-1132 emulsifier. The compositions were held at 50°C to accelerate any breakdown tendencies during storage. While a compound may be unstable at 50°C, it may still possess good stability characteristics at room temperature. Hence the results obtained (Table II), can be used only to predict probable relative stability characteristics for the compositions under ordinary storage.

TABLE II

Effect of Various Addends on Stability of Malathion In an Emulsifiable Concentrate

Addend	% Malathion Initial (calc.)	% Malathion 1 mo. at 50°C.
none	62	62 room temp.)
none	62	58
1% $(C_2H_5)_3N$	61.4	none found
1% CH_3COOH	61.4	55
1% H_3PO_4	61.4	55
1% O,O-dimethyldithiophosphoric acid	61.4	52
2% H_2O	60.7	46
1% $(C_2H_5)_3N$) 2% H_2O)	60.2	34
1% CH_3COOH) 2% H_2O)	60.2	45
1% H_3PO_4) 2% H_2O)	60.2	44
1% O,O-dimethyldithiophosphoric acid) 2% H_2O)	60.2	33

The above results show that moisture, basic or acidic materials, all accelerate rate of breakdown of malathion in the emulsifiable concentrate investigated, and that combinations of moisture and strong acid or base are especially detrimental. Prolonged storage at elevated temperatures should also be avoided.

Stability of Wettable Powders

LONG-term storage tests have been carried out with a large number of different malathion wettable powders. During some of the early experiments it was found that factors such as moisture, pH and metallic

(*Continued on Page* 137)

National Agricultural Chemicals Association

Program

September 7-9, 1955

Wednesday, Sept. 7

WHAT THE FUTURE HOLDS FOR THE INDUSTRY

10:00 A.M. President's Address
W. W. Allen, The Dow Chemical Co., Midland, Mich.

10:30 A.M. "Major Trends in the Pesticide Industry"
W. Moyer, Chipman Chemical Co., Bound Brook, N.J.

11:00 A.M. "A Look into the Economic Future"
H. E. Luedicke, The Journal of Commerce

11:30 A.M. "Safety is Everybody's Business"
A. W. Mohr, California Spray Chemical Corp., Richmond, Calif.

2:00 P.M. Guided Tour of the Walker-Gordon Dairy Farm, World's Largest Scientific Dairy

Largest Scientific Dairy

6:30 P.M. Reception for Members and Guests

8:00 P.M. Board of Directors Meeting

Thursday, Sept. 8

RESEARCH — KEY TO FUTURE GROWTH

8:30 A.M. Early Bird Movies

9:30 A.M. NAC Vice President, Fred W. Hatch, presiding

9:45 A.M. Executive Secretary's Report
Lea S. Hitchner, Washington, D. C.

10:00 A.M. Industry Research Looks Ahead
J. T. Thurston, Amer. Cyanamid Co., Stamford, Conn.

10:45 A.M. A New Approach to Agricultural Chemicals Public Relations
G. E. Lehker, Purdue University, Lafayette, Ind.

11:15 A.M. What Government Research Means to the Pesticide Industry
S. W. Simmons, U.S. Public Health Service, Atlanta, Ga.

7:00 P.M. Banquet

Friday, Sept. 9

UP TO DATE INFORMATION ON THE MILLER AMENDMENT

10:00 A.M. NAC Services to Associate Members
James D. Hopkins, Hopkins Agricultural Chemical Co., Madison, Wisc.

10:30 A.M. Panel Discussion on Miller Amendment
Winton B. Rankin, U. S. Food and Drug Administration
W. G. Reed, U. S. Department of Agriculture
C. W. Palm, New York State College of Agriculture
Moderator, L. S. Hitchner, NAC Executive Secretary

SYMPOSIUM ON MILLER AMENDMENT

THE effects of research and economics on the future of the pesticide industry will be highlighted at the 22nd annual meeting of the National Agricultural Chemicals Association at Spring Lake, New Jersey, September 7, 8 and 9, L. S. Hitchner, executive secretary of the Association, announced early in August.

"Never before have research and economics been more important to the pesticide industry and to the entire field of agriculture," Mr. Hitchner declared. "Pesticides already are making a major contribution toward reducing labor costs on the farm and toward aiding the food industry in various processes involved in delivering high quality foods to consumers at prices they can pay. Through discovering new uses for materials now available and through development of new products, research can greatly increase the contributions the industry will be able to make to agriculture and to the general welfare."

Fred Hatch
Shell Chemical
Presiding at Sept. 8 Meeting

Featured at N. A. C. Meeting

Dr. Jack T. Thurston, American Cyanamid Co., Stamford, Conn., will emphasize the role of research in his report "Industry Research Looks Ahead." Presenting another view on this question, Dr. S. W. Simmons, U. S. Public Health Service, Atlanta, will discuss "What Govt. Research Means to the Pesticide Industry."

Over recent months the agricultural chemicals industry has been concerned with various questions on how the Miller Bill would operate. Some of the questions have been answered, but industry has new questions and is interested in how the Law is working out in practice (See pages 34-38). A highlight of the NAC fall meeting is a panel discussion on the latest developments relating to the Miller Amendment. Participating in the discussion will be: Winton B. Rankin, U. S. Food and Drug Administration; Dr. W. G. Reed, USDA, Dr. Charles W. Palm, Cornell University and John Conner, NAC counsel. L. S. Hitchner, will be moderator.

Winton B. Rankin
U. S. Food & Drug Administration
Miller Panel Speaker

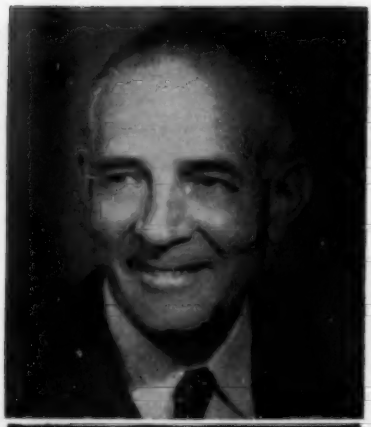
A. W. Mohr
California Spray Chemical Corp.
"Safety is Everybody's Business"
A. W. Moyer
Chipman Chemical Co.
Trends in the Insecticide Industry"

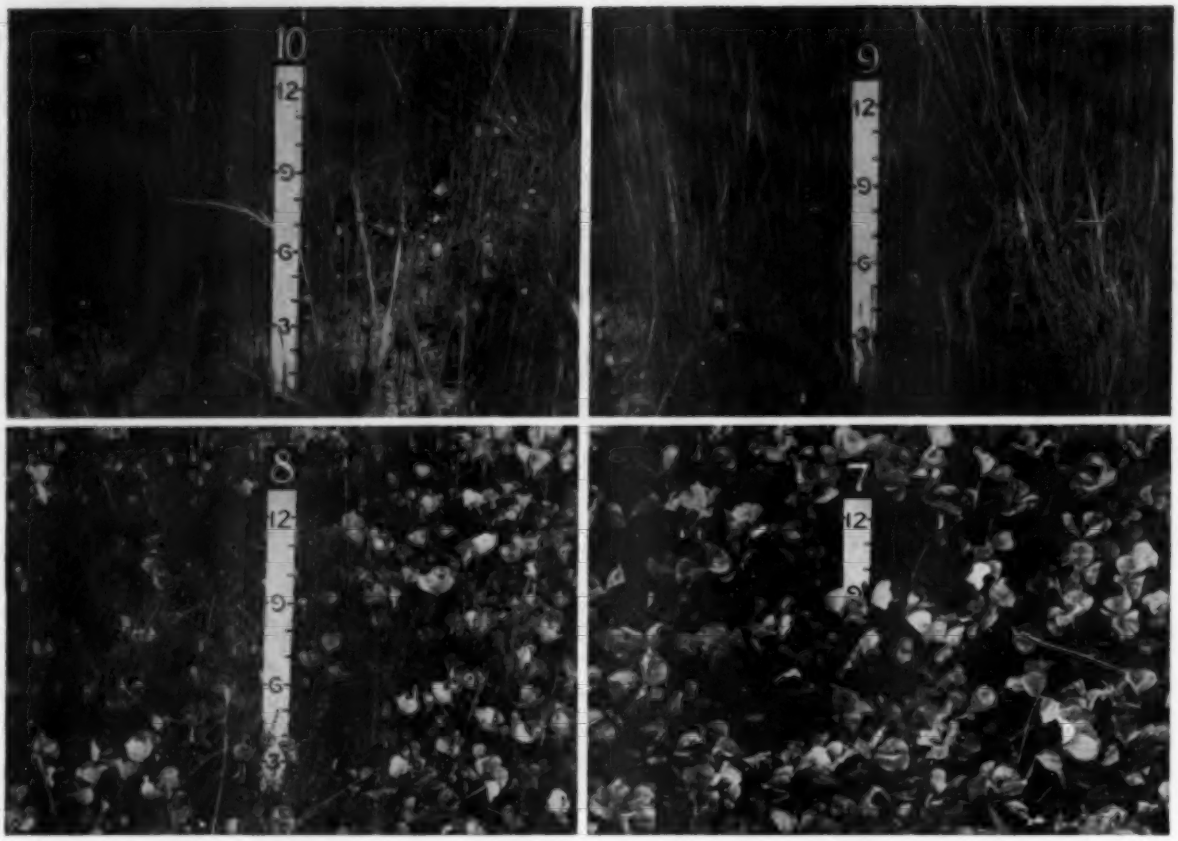
NAC president, W. W. Allen, will open the meeting with an address on "What the Future Holds for the Industry." . . . Following this theme, H. E. Luedicke, *Journal of Commerce* editor, will present "A Look into the Economic Future." G. E. Lehker, Purdue University, Lafayette, Indiana, will discuss "A New Approach to Agricultural Chemicals Public Relations; and "Safety is Everybody's Business" will be presented by A. W. Mohr California Spray Chemical Corp., Richmond, Calif.

A special feature of the 3-day program will be a tour of the Walker-

(*Continued on Page* 122)

J. T. Thurston
American Cyanamid Co.
"Industry Research Looks Ahead"
(lower right:) **Lea S. Hitchner**
NAC Secretary
Miller Panel Moderator
(below:) **W. G. Reed**
U. S. Department of Agriculture
Miller Panel Speaker





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Crops starve where acid soils fix molybdenum in unavailable form. Moly can be released to crops by heavy liming. But direct treatment of the soil with traces of a moly chemical is far cheaper. Sometimes *one ounce* of moly can replace *one ton* of limestone.

Moly makes light liming practical on many acid soils where normal liming is too expensive. Moly lets lime concentrate on its main jobs – supplying calcium, releasing phosphate, and regulating uptake of other plant foods.

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learn why, first hand

A little moly in each ton of fertilizer is BIG crop insurance.

How Moly reduced lime dressings to 1/10 ton an acre

In these test plots, A. J. Anderson and D. V. Moye* showed that treating a highly acid soil (pH 4.6-4.9) with traces of moly reduced lime requirements to only 1/10 ton an acre.

PLOT 10 — **CONTROL.** With only a basal dressing of superphosphate no clover could be established.

PLOT 9 — **MOLYBDIC OXIDE 2 OZ. AN ACRE.** Molybdenum alone was not effective in improving yields.

PLOT 8 — **LIMESTONE 1/10 TON AN ACRE.** Liming gave some improvement even at this low rate, but much heavier dressings were needed for good yields.

PLOT 7 — **MOLYBDIC OXIDE 2 OZ. AND LIMESTONE 1/10 TON AN ACRE.** When traces of moly were added, light liming increased clover yields ten-fold over the control.

*Austr. J. Agric. Res. 3, 95-110 (1952).

MAS-10

CLIMAX MOLYBDENUM

CORROSION

of aircraft structural materials due to agricultural chemicals

By Charles F. Schreiber†

Texas Engineering Experiment Station

TO fill a need expressed by aerial applicators, manufacturers of pesticides and aircraft manufacturers, an investigation was undertaken to study the corrosive effects of the generally used agricultural chemicals on the structural materials encountered in aircraft and dispersing equipment.

Since a relatively small amount of corrosion test work has been done in the agricultural chemical field, a rather extensive testing program seemed necessary. A wide survey of the many aircraft structural materials and finishes was made, and testing program was designed to relate all the commonly used sprays, dusts, spray emulsions and fertilizers with the structural materials and finishes that are met in actual practice.

As an overall summary of results it was found that only two materials tested, type 302 stainless steel and polyester plastic reinforced with fiberglass, offered complete protection from all of the solutions investigated. Monel metal resisted corrosion reasonably well, but brass, aluminum alloy, and chrome-molybdenum steel were all destroyed by certain of the agricultural chemicals.

A furan protective coating with a butyral primer demonstrated the best overall finish characteristics, although none of the applied finishes that were tested withstood all of the agricultural chemicals without damage.

Metals
- 24S-T3 Alcad aluminum alloy sheet
- 4130 Chrome-molybdenum steel sheet
- Brass alloy sheet
- Monel metal sheet
- Tye 302 stainless steel sheet

The corrosive effects of the various chemicals were tested on the following materials used in aircraft structures and distribution equipment.

Plastics
- Clear vinyl plastic sheet
- Clear Plexiglas sheet
- *Polyester resin "A". This is a plastic reinforced by interwoven fiberglass
- **Polyester resin "B". A similar polyester resin plastic reinforced by interwoven fiberglass

All partially submerged tests were conducted at room temperature and based on an aircraft spray coverage of four gallons per acre. All chemical concentrations per acre, as taken from entomology laboratory data and agricultural chemical manufacturer's reports, were calculated on a proportional level to correspond to a pound per acre basis. Submerged tests were carried out in 125 milliliter glass containers with specimen coupons that extended in both the liquid and vapor regions of the vessel. Concentrations were maintained at values actually used in practice. In cases where high and low concentrations were employed, both extremes were tested. Micrometer measurements were obtained for all specimens with an applied finish, although visual effects were easily noted.

Because of the severe finish attacks shown by such insecticides as parathion, TEPP, Aramite, heptachlor, and dieldrin, several test samples were run under the same conditions and solution concentrations. Results on this type were taken as an average of all samples run. When an early blistering effect was noted on a coupon, an improper finish application might be suspected; therefore another coupon was started on the test procedure. However, in all cases every coupon exhibited a proper finish application and therefore no test data had to be deleted.

*Polyester resin "A"—Manufactured by Beetle Plastic Corp. under the tradename "Bonate".

**Polyester resin "B"—Supplied by Fabri Mold Tool Engineering Co., and composed of Selectron 5003, manufactured by the Pittsburgh Plate Glass Co., and a Garylst sun cure catalyst manufactured by the Thalco Corp. of Los Angeles.

†Abstract of detailed report by C. Schreiber on corrosion due to agricultural chemicals.

Results and Discussion

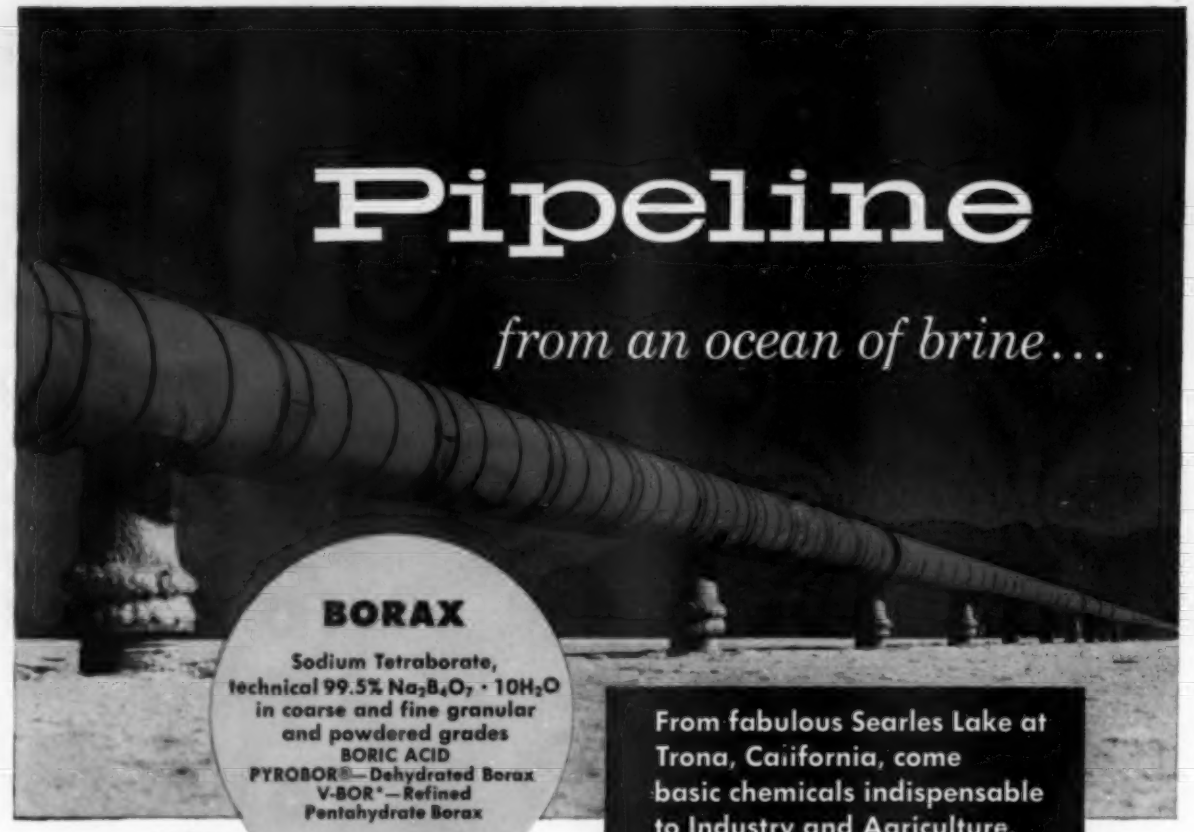
Results presented are from data obtained over the entire testing periods. In order to evaluate the specimens at the end of the test, a rating system was necessary. The conclusions as used were not presented in a highly technical manner, since the overall object was to determine if the finish would or would not stand up under the different environments. See Table on page 53.

E—*Excellent*	Sample unaffected physically although a color change may have taken place.
G—*Good*	Finish showing very slight blisters, or creep at scratch areas. Finish not easy to scrape off. Good metal protection.
F—*Fair or* A—*Acceptable*	Excellent for a limited period of time, finish still protecting at end of test. Slight blistering although finish shows good bonding over 90% of area.
U—*Unacceptable*	Finish lost bonding rapidly, severe blisters, charred surface, severe splitting, finish disentegration, no protection.

Metals With No Applied Finish

THIS group of specimens was composed of 24S-T3 Alclad aluminum alloy, 4130 chrome-molybdenum steel, half-hard brass sheet, monel metal and type 302 stainless steel.

Aluminum alloy, 24S-T3 Alclad.—The 24S-T3 aluminum alloy was rapidly and severely attacked in the partially submerged tests by sodium



BORAX

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V-BOR*—Refined Pentahydrate Borax

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cyanamide and TCA herbicides. A variety of aluminum alloys were tested with TCA and all demonstrated severe corrosion. Recent work by Alquist and Wasco* run on 50% solutions of TCA show that corrosion can be inhibited or prevented by mixtures of sodium chromate or sodium dichromate. Approximately 0.7% sodium dichromate will stop all corrosion on solutions near 50% TCA. Tests on this project were not run using the sodium dichromate or sodium chromate although investigations on this work should prove valuable.

The aluminum alloy was also susceptible to water after a period of 24 days. Pitting commenced at the liquid-vapor interface and spread rapidly.

In the atmospheric tests the 24S-T3 Alclad aluminum alloy was totally destroyed by the TCA solution, commercial fertilizer (8-8-8), and magnesium chlorate solution. The DDT dust, Toxaphene-sulfur dust, Bordeaux mixture, and the arsenate dust caused metal pitting, although a longer testing period would be necessary to evaluate the results properly.

Steel, 4130 chrome-molybdenum.—From data collected on 4130 chrome-molybdenum steel it may definitely be concluded that an applied finish is mandatory for this steel. The average time necessary for severe metal action in the partially submerged tests was six days. It was attacked very rapidly under all environments in atmospheric tests.

Brass, half-hard sheet.—The half-hard brass was severely attacked in the partially submerged tests by the cyanates, cyanamides, and sulfamate compounds. Rapid interfacial destruction was noted on many samples after 30 days.

The brass alloy demonstrated essentially identical destruction properties in atmospheric and submerged tests. Heavy scaling and metal destruction were caused by TCA, the sulfamates, commercial fertilizer (8-8-8), DDT dust, and Toxaphene-sulfur dust. The cyanates and cyanamides formed heavy protective films at 20 days exposure, thereby eliminating metal destruction.

Monel Metal.—Monel metal was excellent in the partially submerged tests, with the exception of the highly concentrated potassium cyanate solution which gave a slight pitting effect. Although several chemicals discolored Monel metal, no major destruction was evident.

Under an atmospheric environment Monel metal exhibited higher corrosion rates than during the submerged tests. Pitting commenced at 50 days upon all specimens contacted with DDT dust, Toxaphene-sulfur dust, potassium cyanates, and the arsenate dust insecticides.

Stainless steel, type 302.—In the partially submerged tests type 302 stainless steel demonstrated complete resistance to corrosion throughout the test period.

In the atmospheric tests type 302 stainless steel exhibited excellent resistance to all materials with the exception of Toxaphene and sulfur dust insecticides. Minute pitting commenced on the steel at 60 days, although only very slight metal damage was evident.

Finishes Applied to Metal

THIS portion of the investigation was concerned primarily with the effects of the various agricultural chemicals on basic finishes. Hence, three finishes were applied only to the 24S-T3 Alclad aluminum alloy and the 4130 chrome-molybdenum steel. Two other finishes, modified chlorinated rubber formulation and the liquid Neoprene coating, were tested on an aluminum alloy and 4130 chrome-molybdenum steel, respectively.

Furan Finish. — Prepolymerized furan coating preceded by a wash primer of the polyvinyl butyral group exhibited the best overall finish. The finish was attacked vigorously by only five solutions in the partially submerged tests: TEPP, Aramite, Parathion, Dieldrin, and Heptachlor. This finish bonded very well to both 24S-T3 Alclad aluminum and chrome-molybdenum steel.

In atmospheric tests the furan finish on 4130 chrome-molybdenum steel also showed excellent bonding properties with all solutions contacted. As the test progressed, this finish remained intact and no swelling was noted. TEPP solution caused very slight blisters at 60 days, although good metal protection was still available at 79 days exposure.

The furan finish on 24S-T3 Alclad aluminum was attacked only by the commercial fertilizer (8-8-8). Destruction of the metal under the finish caused the surface finish to disrupt and crack. Bonding as demonstrated by this finish on aluminum was excellent to the point that TCA did not react with the metal through the surface scratch. A longer testing period should possibly be employed with this paint system.

Atmospheric results show that the above destructive compounds are practically inactive when washed from the samples after use. This implies that a furan finish would be highly acceptable for all compounds tested if the hopper or spray tank was washed after each use.

Epoxy-Based Finish. — Epoxy-finish on 24S-T3 Alclad aluminum alloy and 4130 chrome-molybdenum steel was generally acceptable, but showed very brittle properties when removed from a solution. This was especially true with the cyanates in both the immersed atmospheric tests. The epoxy-base finish on 24S-T3 Alclad aluminum alloy exhibited brittle properties to the extent that surface cracking began. Parathion and Aramite did not attack this finish readily and it may be stated that the epoxy finish was the only applied finish that resisted these chemicals.

Vinyl Plastic - Base Finish. — Vinyl plastic-base finish preceded by one coat of a chromate wash primer and one coat of an intermediate finish, was applied to both the 24S-T3 Alclad aluminum and the 4130 chrome-molybdenum steel. This finish covers with a very low film thickness dimension and bonds very well to steel and aluminum when the sur-

(*Cumulative tables on page.* 53. *Article Continued on Page* 126)

*Alquist, F. N. and Wasco, J. L.: The Inhibition of Sodium Trichloroacetate Weed-Killer Solution. *Corrosion Magazine*, December 1952.

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Material Conc., Solvent	24S-T3 Alclad Aluminum Alloy No Applied Finish—75 days	4130 Chrome-Molybdenum Steel No Applied Finish—6 to 39 days	HALF-Hard Brass Sheet No Applied Finish—73 days	Monel Sheet, standard cold rolled No Applied Finish—82 days	Type 302 Stainless Steel No Applied Finish—73 days	Prepolymerized Furan Finish* 24S-T3 Alclad Aluminum Alloy—82 days	Prepolymerized Furan Finish* 4130 Chrome Molybdenum Steel—60 to 82 days	Epoxy-based Finish* 24S-T3 Alclad Aluminum Alloy—80 days	Epoxy-based Finish* 4130 Chrome Molybdenum Steel—80 days	Vinyl Plastic Base Finish* 24S-T3 Alclad Aluminum Alloy—83 days	Vinyl Plastic Base Finish* 4130 Chrome Molybdenum Steel—70 days
ALDRIN .0625 lb/gal., xylene, kerosene	E		E	E		E	E	E	E	E	E
CHLORDANE .25 lb/gal., water	G		E	E		E	F	U	E	E	A
TEPP .375 lb/gal., kerosene	G		G			U	U	U	U	U	U
TOXAPHENE .375 lb/gal., kerosene	G		E			E	E	E	E	E	E
ARAMITE .25 lb/gal., water	F		E	E		U	U	E	G	U	U
BHC .0625 lb/gal., xylene, kerosene	G		E			E	E	E	E	E	E
POTASSIUM CYANATE 2% water	E		U	E		A	G	E	A	E	F
POTASSIUM CYANATE 4% water	E		U	A		E	F	E	A	E	G
SODIUM CYANAMIDE 4% water	U		F	E		E	A	U	E	E	A
MAGNESIUM CHLORATE .1 lb/gal., water	A		G			E	G	A	E	E	A
MAGNESIUM CHLORATE .4 lb/gal., water	A		G			E	E	E	E	G†	A**
TCA 1.25 lb/gal., water	U		E			E	A	E	F**		A**
LIQUID FERTILIZER 6% N, 25% H_2PO_4, 15% k .06 lb/gal., water	A		E			E	E	E	E**	E	A**
LIQUID FERTILIZER .2 lb/gal., water	A		E			E	E	E	E	E	A
AMMONIUM SULFAMATE .75 lb/gal., water	E		U			E	E	E	E	E	E
2,4-D, Sodium salt .5%, water	A		E			E	E	E	E	E	G
PARATHION .5%, water	E		G			U	U	U	E	U	U
2,4,5-T .2 lb/gal., water	U		F			E	A**	A	E	E	U
CARBAMATES .5%, $ZnSO_4$ water	E		E			A	A**	E	E	U	G
CARBAMATES 5.0%, ZnSO water	E		E	E		A	A**	E	A	E	G**
WATER	A**		F			G	E	E	E	G	A**
KEROSENE	E		E			E	E	E	E	E	E
XYLENE xylene 10%, kerosene 90%	E		E			E	E	E	E	E	E
DDT .1 lb/gal., xylene, kerosene	E		E			E	E	E	E	E	
DIELDRIN & water .0625 lb/gal.	A**		E**			U	G**			U	
HEPTACHLOR & water .0625 lb/gal.	A**		E**			U					
AMMONIUM NITRATE 10%, water	E		E**			E				E	

All samples unaffected. Excellent resistance was shown in each environment

The length of tests varied from 6-39 days. This material is highly susceptible to all of the water carrying solutions

All tests conducted at room temperature under partial submergence † excellent if scratch free ** for short periods only
*A scratch was made on one side of each specimen to simulate finish damage under actual operating conditions

Figure 1: Cranes discharging Nitrolime in bulk from the "Maragrethe Honold" at Gulfport, Miss.

Figure 2: Enlargement of crane bucket during initial discharging operations.

Figure 3: Interior view of warehouse where trucks unload cargo.

Packaging

MEETING the problem of handling and packaging a difficult nitrogen product has been accomplished by the Walsh Stevedoring Co., Gulfport, Mississippi.

Nitrolime is produced in three large modern nitrogen plants located in the various parts of the Netherlands. The product consists of fixed amounts of finely ground limestone ($CaCO_3$) mixed with a solution of ammonium nitrate, which is then evaporated, dried and granulated. The resulting nitrogen fertilizer, in addition to the 20.5 per cent nitrogen, contains approximately 35% limestone. The limestone is added principally to reduce the hygroscopicity of the finished fertilizer.

Nitrolime is shipped from Holland in bulk by steamers to a number of large port side installations along the southeastern and gulf coast. At Gulfport, Mississippi, the Walsh Stevedoring Co. uses crawler cranes to unload the ship holds. Where occasion requires, the ship's cargo gear is used also, providing that winches are in condition to meet the discharging requirements. The only time the ship's gear is used is if the vessel's lay time is critical, or plenty of warehouse space is available.

The material unloaded by the crawler cranes (Figure 1) is discharged into portable hoppers under the crane's bucket. It is in turn loaded into dump trucks where it is carried into an adjoining warehouse and piled mechanically (Figures 2, 3).

The material is gravity fed into the dump trucks from the portable hoppers. The trucks in turn dump into the conveyor hopper (Figure 3). The material is piled to approximately 21 ft. in height. From these piles the material is dumped into a conveyor hopper (Figure 4). A trough type rubberized belt conveys the material up into the portable sacking scale hopper (Figure 5). This portable sacking scale hopper has a capacity of 5 tons.

Two Exact Weight high speed sacking scales, Model 2229 (Figure 6) are fed by means of a 10"x10" single clam shell type valve mounted on the bottom of the sacking scale hopper. This valve operates by means of an air cylinder mounted on each hopper valve. The Exact Weight sacking scale is equipped with mercury magnetic controls which automatically close the valve when the correct weight is delivered to the multiwall paper bag hanging on the sacking scale.

The Nitrolime is gravity fed into the bag, which is held in filling position with the lock jaw type bag-

holder, (Figure 6). Initial feeding of the material is controlled by push button switch which actuates the air cylinder to open the valve. The 10"x10" valve provides rapid initial fill of the bag. As the scale approaches the last few pounds of the desired weight, the scale controls move the filling valve to a partially closed, or "dribble feed" position. When the load reaches correct weight, the valve is closed completely by the scale control circuit.

The 100 pound net weight filled bag then moves along a powered conveyor belt to the sewing machine for the bag closing operation. Bags are then placed on pallets, or placed on hand trucks depending on type of carrier. The sacking machines are opposed to prevent traffic congestion.

Because of the characteristics of nitrogen products, the sacking speed is highly essential. Mr. Crosland, manager, states that they are obtaining sacking speeds of 35 tons per scale per hour, or better than 11 - 100 lb. bags per minute. Four Exact Weight Sacking Scales now in use give them a total output of approximately 44 bags per minute. Over 1000 tons per 8 hr. day have been handled on these four sacking scales.

Previous to installation of the automatic sacking scales, this company used four standard sacking scales. With the new installation, 8 man hours per day per scale, or a total of 32 man hours per day have been saved. This represents an increase of 10 tons per scale per hour.

The machinery and man hours are engineered to feed material from the ship to storage, from storage to bagging and finally expediting every bag, totalling over 1000 tons per day. A warehouse with bagging area of 22,000 square feet provides ample storage and workroom.★★

Nitrolime at Walsh Stevedoring

Figure 4: Bulk nitrolime is dumped into conveyor hopper.

Figure 5: Rubberized belting conveyor carries material from conveyor hopper onto portable sacking scale hopper.

Figure 6: Exact Weight Sacking Scales at Walsh Stevedoring Co., mounted on portable stand and hopper.

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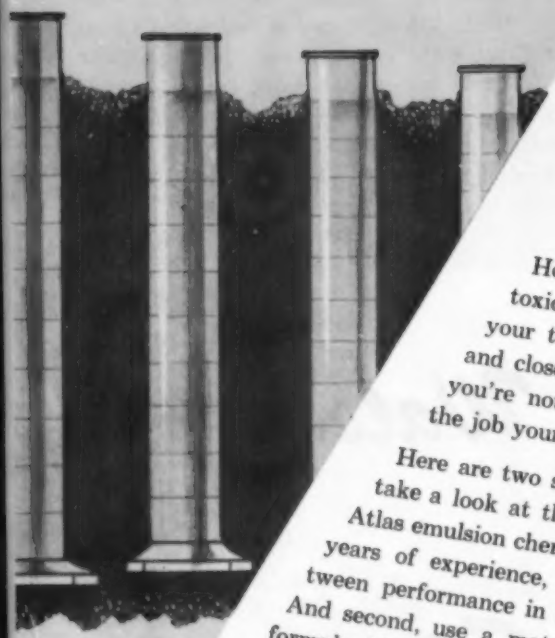

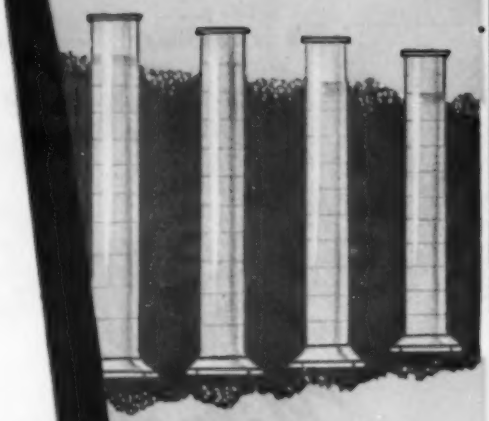

How do you evaluate your toxicant concentrates? Unless your test methods are consistent and closely simulate field practices, you're not getting a true picture of the job your emulsifier is doing.

Here are two suggestions from Atlas. First, take a look at the evaluation methods which Atlas emulsion chemists have developed, through years of experience, to give close correlation between performance in the laboratory and the field. And second, use a matched Atlox emulsifier in your formula. You'll be sure of top performance.

Many other important factors need consideration in choosing the right emulsifier for your product. If you will send us the information listed in the table below, we'll be glad to recommend an Atlox emulsifier that fits every requirement of your specific toxicant concentrate.

EMULSION DATA CHECK LIST

1. Toxicant used _____
2. Solvent used _____
3. For water hardness _____ ppm.
4. Recommended dilution _____
5. Lbs. toxicant/gal. of concentrate _____
6. Desired emulsion stability _____
7. Shelf life period expected _____
8. Ease of dispersion important? _____
9. Packaging: bulk _____ or small container _____
10. How is concentrate mixed and evaluated in laboratory tests? _____

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C. O. Johnston Elected President at Ohio Pesticide Institute Joint Meet with Phytopaths

Top Photo: Dr. H. C. Young, associate chairman of the department of botany and plant pathology, Ohio Experiment Station; Dr. Helen Hart, national president, American Phytopathological Society; Dr. M. B. Linn, secretary-treasurer, north central division, APS.

Bottom Photo: Dr. C. R. Cutright, Ohio Station entomologist, described apple mite control methods to OPI members.

THE Ohio Pesticide Institute and the north central division of the American Phytopathological Society held joint meetings at the Ohio Agricultural Experiment Station, Wooster, Ohio, August 8-10.

Pathologists convened August 8 and were joined by OPI members for the afternoon tours and banquet on August 9.

Of special interest to APS members was the panel on systemics. Sixteen representatives of industry and land grant colleges held an informative discussion, with Dr. H. C. Young serving as moderator. Dr. Young is associate chairman of the Ohio Station's department of botany and plant pathology.

Prior to talks from panel members, Dr. Young said there is a $3 billion annual loss from plant diseases. Growers could prevent half this loss if they practiced what they should. The other 50 percent offers a world of opportunity to phytopathologists, he said.

Speaking on the use of antibiotics as systemics, Dr. J. L. Lockwood, Ohio, said they are an important source for plant disease control, but that much remains to be learned.

He cited the preveition of fireblight as one of the most spectacular uses. One advantage of antibiotics used systemically, he advised, is that they are not toxic. However, pathologists know little about tissue penetration. Early tests show that the addition of glycerine to a solution gives somewhat better penetration.

G. L. Brandes of Rohm and Haas spoke on the role of physiology in systemics. Declaring that there is too much emphasis placed on "squirt gun botanists," Mr. Brandes said we need to back up to the basic physiology of the plant.

In discussing chemotherapeutics, W. H. Bragonier, Iowa, said injection of systemics has not worked too well, as yet.

Dr. M. C. Shurtleff, Iowa, described results of screening tests carried on during the past five years. He said Merion bluegrass is used in a cereal disease study instead of oats, because it gives a better evaluation of the worth of systemics.

W. Q. Loegering, J. M. Daly and W. C. Haskett of the U. S. Department of Agriculture reported on the USDA program for systemics in cereal diseases. They requested industry to send in any new materials showing promise in the control of cereal rusts. These will be tested by the department.

The best way to evaluate systemics, stated J. B. Harry, is to follow the distribution through the live plant by chemical analysis and by radioactive tracer element techniques.

Methyl bromide gas has given good results in the control of nematodes, states J. H. Davidson, Dow Chemical Co.

J. B. and J. S. Skaptason, Pittsburgh Coke and Chemical, presented a short movie feature on rust screening methods which employed new types of laboratory equipment developed by this company.

In summing up the forum on systemics, Dr. H. C. Young said he foresees a revolution in the types of spray equipment needed in the future for application of systemics.

Chief speaker at the combined banquet meeting was Dr. Erick Sharvelle of Purdue. Dr. Sharvelle called for creation of a nationally organized steering committee on systemics to effect better coordination of research efforts. At the same time, he challenged APS to assume a greater role of leadership in developing agricultural chemicals.

"We must realize that agriculture is the biggest basic industry of our nation," the speaker pointed out. "The annual income from farming is over $18 billion and is greater than the combined income from mining, autos, banking, rubber, tobacco, and forest products."

During a business meeting, members of the north central division, APS, elected the following as officers for the coming year: Dr. C. O. Johnston, Kansas State College, president; Dr. J. J. Christensen, University of Minnesota, vice-president; and Dr. M. B. Linn, University of Illinois, secretary-treasurer. Dr. Ralph Shay of

(*Continued on Page* 106)

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THE

Yellow Clover Aphid ON ALFALFA

By W. A. Baker

USDA, Agricultural Research Service

IN 1954, a pest new to alfalfa in The United States, developed in outbreak numbers in California and in the Southwest, causing an estimated damage to this crop of at least four million dollars in New Mexico, $500,000 in Arizona and $337,000 in California. In Nevada, some alfalfa stands were reduced as much as eighty percent. It was indicated that this pest was the common yellow clover aphid, *Myzocallis trifolii*, a species that has occurred on clover in this country for many years. It has been found principally on red and white clovers and on sweetclovers and burclovers, although causing little damage to these crops. Extensive observations on the host plant relationships of the eastern form of this aphid, however, have shown that it is not well adapted to development and survival on alfalfa. It is now generally considered that the form associated with the current outbreak on alfalfa is a new introduction into this country, and is probably a different species from that common on red clover east of the Mississippi River, and extending at least as far west as Kansas and Nebraska. Until it is possible to separate definitely these closely related aphids, the distribution of the one now threatening all alfalfa-producing regions of the United States. must be associated with its occurrence on alfalfa.

In 1955, the yellow clover aphid continued to cause widespread damage to alfalfa in all previously infested States in the Southwest, and serious infestations have occurred in parts of Oklahoma, Texas, Utah and Kansas. Infestations reported to date on mixed stands of clover and alfalfa in Nebraska are probably not the alfalfa form, as laboratory cultures of field collected yellow clover aphids in Nebraska have not been able to survive when exposed only to alfalfa in the laboratory.

The yellow clover aphid is rather small, pale yellow and from 1/16 to 1/8 inch long, with four rows of black spots on its back. It is frequently mistaken for the pea aphid, but is much smaller and generally has different feeding habits. The yellow clover aphid usually infests the older leaves near the base of the alfalfa plant first, and then extends its feeding upward. The pea aphid, on the other hand, tends to reverse this pattern, feeding first on the terminals and then going downward. In addition, the pea aphid is light green and does not have spots on its body.

In the Southwest, most forms of the yellow clover aphid are females and reproduce without fertilization. Each insect produces 25 to 100 living young and there may be as many as 20-30 generations a year. Under optimum conditions the aphids probably give birth to new offspring every few hours and with this high reproduction potential, a rapid buildup of population results.

When yellow clover aphids are abundant, they reduce yields of alfalfa by sucking the juices from the leaves, causing them to curl, turn yellow and fall off. A sooty mold grows on the honeydew which accumulates at the base of the plant. Heavily infested fields are conspicuous after cutting by the blackened condition of the plant crowns. Hay cut from these fields is of inferior quality and where much honeydew is present, it cannot be dehydrated satisfactorily. Hay with a high honeydew content turns black in the dehydrator due to the carmelization of the honeydew. Growers have found that the honeydew sticks to the tires of tractors, and they often have to wash out their balers with fire hoses to get rid of the gummy substance.

In addition to the honeydew damage and the reduction in yields of established alfalfa, the aphid has been responsible for the complete killing of large acreage of spring and fall-seeded stands. Their feeding seems to be poisonous to the alfalfa plant, particularly to the young seedlings. The small plants die suddenly from the feeding injury, even when infested by only one or two aphids. Regrowth following cutting is also retarded and in many cases the average 4-year life of a stand has been reduced to 2 years.

Investigations on the use of insecticides for aphid control were initiated as soon as the seriousness of the problem became evident. These studies by State researchers established that infesting populations could be readily controlled by a wide range of insecticides, including the chlorinated hydrocarbons and organic phosphates. The effectiveness of the insecticides has been lessened, however, because of the rapid reinfestation of fields from migrating adults or occasional skips within fields when applying the chemicals. Both spray and dust preparations have been found effective, and they may be applied with either ground or airplane equipment. The insecticide to be applied is determined to a considerable extent by whether the crop is to be harvested for hay or for seed. The chlorinated hydrocarbons provide longer lasting control, but should be used only on seed crops because of the possibility of feed contamination. The phosphate compound, on the other hand, while providing excellent aphid controls for short periods, do not remain effective long enough to control reinfestations, and require frequent repeat applications. Insecticides that have been found to be of most aid in combatting this pest include malathion, parathion, Systox,

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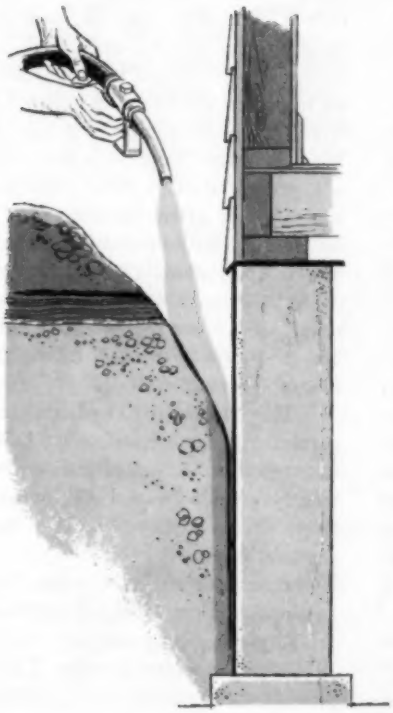

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Now you can offer your customers better protection against termites over a longer period of time. In many areas, your customers already know about dieldrin's effectiveness on soil insects that attack lawns and ornamentals.

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toxaphene, and toxaphene-DDT mixtures. Experimentation on the use of insecticides is continuing and their effectiveness and safety are being constantly improved. We can anticipate that practical and more economical ways of treating alfalfa will result from these studies, and that growers will be able to continue to produce quality alfalfa hay and seed crops, even though current aphid population pressures continue to be experienced.

Complementing chemical control studies, other methods of combatting the aphid are also receiving major attention. Of particular importance, is the long range program for developing alfalfa strains resistant to the aphid for use in the alfalfa breeding program. Nursery and field observations by State and Federal investigators have shown that certain alfalfa lines carry resistance to the aphid. In the alfalfa nursery at Brawley, California, where some 2,000 clones representing 200 lines were examined, possible resistance was observed in 103 clones representing 10 varieties or lines. Of these, 84 were of Lahontan origin, 18 from Atlantic, Persian or African, and 1 clone from a double cross between selections of Grimm, Hardistan, Turkistan and *Medicago falcata*. All of the clones displayed excellent growth and low aphid populations under severe conditions of infestation. Lahontan has also shown evidence of strong aphid resistance in other California nurseries and in Arizona. The varieties African-Cal and African have been more tolerant to the aphid than many of the more susceptible varieties when exposed to severe attack, having stands 16-25 percent when the other varieties were early completely destroyed. Young aphids on the resistant plants appear to scatter over the terminal leaves and either die or leave the plant before becoming full grown. On the susceptible plants the young aphids usually remain close to the mother on a single leaf and develop normally with a high survival. With the several sources of aphid-resistant alfalfa that have already been found, and the prospect for locating additional sources as the studies continue, introductions of resistance into the various adapted alfalfas should only be a question of time necessary to carry through the breeding program. Varietal resistance, even under the most severe exposures, would partially supplement chemical measures, thereby reducing the overall application volume by decreasing the treatment frequency, and possibly the need for control in many fields.

Another phase that is being explored extensively as an aid in combatting the aphid is that of biological agencies. Many of our common aphids are prevented from developing to outbreak numbers by parasites, predators, and diseases. Neither parasites nor diseases have been of importance in reducing numbers of the yellow clover aphid in the Southwest, and a worldwide survey has been initiated to find possible natural enemies of the aphid in foreign countries for introduction and testing in the United States. Entomological explorers of the California Experiment Station and the U. S. Department of Agriculture are now conducting a search in the Near East and in Europe and similar exploration is being planned for India.

One of our common lady beetles, however, has been of some importance in repressing and controlling the yellow clover aphid in some areas this season. One of its disadvantages is that they have appeared generally in large numbers too late to control the aphid on the early crops. In Arizona late in April and during May, populations of the lady beetle increased rapidly and generally in fields that had not been treated with insecticides for aphid control or where there had been a considerable interval since the application of insecticides toxic to the lady beetle. The larvae and adults of the beetle have cleared some fields heavily infested with aphids to the point where it was difficult to find a surviving individual. Such instances emphasize the critical need for managing our biological and insecticidal control programs to assure that the maximum benefits of each will be utilized to their full potential to aid in the production of alfalfa with a minimum cost and disturbance from the aphmid. Although it is not to be expected that any single control method will provide a complete solution to the aphid problem, we can anticipate that a combination of the proper use of insecticides, taking full advantage of natural factors, and the development of aphid resistant varieties of alfalfa will be effective in eliminating this insect as a major factor in alfalfa production.★★

Editors Note:

A recent bulletin issued by the USDA (Bulletin ARS-33-11, Prepared by the USDA Entomology Research Branch) reviews the problem of the yellow clover aphid on alfalfa, and discusses the following control measures being used in specific sections of the U. S.

RESEARCHERS in infested states have reported on a wide range of insecticides that will control the yellow clover aphid. But there are limiting factors connected with them.

The organic phosphorus compounds, such as parathion and malathion, which remain on the plants for only a short time, can be used on either forage or seed crops, and insecticides of this type must be relied on to protect alfalfa being grown for hay. They provide immediate control, but their short residual action does not prevent damage from reinfestation. Aphids often reinfest crops 4 to 7 days after treatment. Therefore several applications are necessary to control the insect. Parathion or malathion should not be applied when bees are active in the field during the blooming period of alfalfa.

The chlorinated hydrocarbons, particularly toxaphene and DDT mixtures, provide longer lasting control, but should be used only on seed crops because of the possibility of feed contamination.

Entomologists in Arizona, California, and New Mexico have tested DDT, malathion, parathion, endrin, BHC, Systox, sulfur, nicotine, TEPP, toxaphene, Perthane, and combinations of several of these insecticides to control the yellow clover aphid. They found that a number of them showed excellent short-run results, but repeat applications were necessary to destroy reinfestations.

(*Continued on Page* 122)

INSECT PREVENTIVE PROGRAM for PEANUT WAREHOUSES*

FARMERS' stock peanuts are usually infested by a number of stored-product insects if held in storage for any extended period. In commercial practice it is customary to shell peanuts during the winter following harvest. The shelled nuts are used before insect infestation becomes a problem, or are stored under conditions not favorable to infestation, as in cold storage.

Beginning with the 1952 crop, the government price support program has been carried out through loans to producers and cooperatives on farmers' stock peanuts, and relatively large quantities of these peanuts have been held in storage through the summer following harvest. Many peanuts have been damaged by insects while in storage, lowering their quality. In some instances the damage has rendered the peanuts inedible.

The usual practice that has been followed when farmers' stock peanuts have become infested is to fumigate the warehouse, or individual lots of peanuts. Often warehouses are not tight enough for successful fumigation, or for other reasons fumigation has not been satisfactory. In addition, fumigation destroys only those insects present, and reinfestation can readily occur if nearby sources of infestation are prevalent and the peanuts remain in storage for a considerable period.

The stored product insects which attack farmers' stock peanuts are of two groups: several species of moths and numerous species of beetles. The former group includes the almond moth, Indian-meal moth, and the Angoumois grain moth; while the second group is comprised primarily of the saw-toothed grain beetle, the flat-grain beetle, the Cadelle, and the flour beetles.

The insects attacking farmers' stock peanuts in storage come from sources within the warehouse. Peanuts are usually free of stored-products insects when they are brought in from the field. The peanuts can become infested as soon as they are placed in storage in the fall, if local sources of infestation are present. With the advance of cool weather in late November and December insect activity is limited, and the degree of infestation does not increase until spring.

Preventive Program

IN 1953 investigations were begun to study the manner in which farmers' stock peanuts are damaged and the methods by which infestations might be prevented or held to a non-injurious level. These studies indicated that the insect infestation can be delayed and held to a noninjurious level for a considerable period by: (1) cleanup of warehouse and environs, (2) application of residual sprays to the warehouse before filling, and (3) periodical application of aerosols.

DDT residual sprays are suggested for application to warehouses before filling. A 2.5 percent DDT spray may be applied at the rate of 2 gallons per 1,000 square feet (about the point of runoff); a 25 percent emulsifiable concentrate is suggested at one quart to 2½ gallons of water; or a 50 percent wettable powder used at one pound per 2½ gallons of water. The emulsion need not be agitated, but the wettable powder should be constantly agitated while being applied.

Aerosol applications should be started as soon as the peanuts are placed in the warehouse: weekly for the first two applications, then every two weeks until the middle of November. Applications should be resumed in early March and applied at 2-week intervals through the summer, or until the peanuts are removed from storage.

Aerosols are relatively inexpensive and are quickly applied to large spaces; hence, it is practical to make frequent applications. They must be considered only as a *preventive* measure, not a *cure*. Their purpose is to prevent infestation by killing off insects attempting to invade the storage in the pile. The aerosol applications are not too effective since they contact only those adults that crawl on the surface or fly over the peanuts. Different formulations are needed for different types of aerosol generators. These are designated as formulas 1 and 2.

Formula No. 1

For use in mechanical generators such as the Microsol, Challenger, or Skilblower, or as a spray.

Pyrethrins	0.5 percent
Synergist (piperonyl butoxide, sulfoxide, n-propyl isome, or MGK 264)	5.0
Tetrachloroethylene	50.0
Deodorized kerosene	44.5

Mixing directions when formulated on the job:

Concentrate containing 5 percent pyrethrins and 50 percent synergist	2 pints
Tetrachloroethylene	6 pints
Deodorized kerosene	8 pints

Application rate:

1 pint per 10,000 cubic feet of space above the load, or 2 gallons to an average warehouse 100 x 100 feet, with 15 to 20 feet of space above the load.

***Note*: Where peanuts are piled almost to the roof, apply as a wet spray to the top surface of the load, at the rate of 2 gallons per 100 x 100 feet of surface.**

Formula No. 2

For use in thermal type generators, such as the Tifa, Swingfog, etc.

Pyrethrins	0.2 percent (by weight)
Synergist	2.0
Tetrachloroethylene	50.0
Deodorized kerosene	47.8

(*Continued on Page* 131)

*Based on Bulletin AMS-58 by the USDA, Marketing Research Service. Prepared by the Biological Sciences Branch, Stored Product Insects Section.

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WASHINGTON *Report*

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

IT has been a pretty good year in the agricultural insecticide business. No one claims that the "promised land" has arrived, but it's refreshing to find that things are going well in a good many quarters.

The bounce and exuberance may give the industry a running start on what promises to be a year of transition. The transition will shift much of the primary sources of information about the recommendations and use of pesticides from the Government to industry. In short, industry will have more of a lead and all of the responsibility that goes with it.

Primary reason for this is the expectation of more and more residue tolerance decisions by the Food & Drug Administration. Since most of the decisions specify limited uses of pesticides, the best source of information on the status quo at any given moment will be primarily the basic manufacturer. But by its nature, the government doesn't move as fast as industry. With Food & Drug making the tolerance decisions, and the USDA and agricultural experiment stations charged with making recommendations for the use of materials, there's a good likelihood the Government will be lagging behind. There's also the question of whom to go to in the USDA to get a quick answer on the status of a chemical.

Imagine also the vast amount of literature printed by the USDA and agricultural experiment stations which will require revision to coincide with the new tolerances. The job is tremendous.

As the Miller Law becomes operative it's apparent that the Food & Drug Administration intends to hold certain positions and take the issues to court if necessary. This applies particularly to milk. The agency favors zero tolerances for milk. Officials feel that the nation's mothers would not accept the idea of any milk with a legal residue. The Food & Drug Administration intends to hold to this position even though there's an application pending requesting a tolerance for milk. The agency is making it clear that the burden of proof rests squarely on the petitioners.

There are continuing meetings between the USDA and the Food & Drug Administration on subject of tolerances for meat. No tolerance or exemption for meat has yet been made. Applications are pending before the Food & Drug Administration to establish tolerances for DDT, lindane, and methoxychlor in meat.

Officials are not as outspoken about meat as they are on milk. The feeling is that if any tolerances are permitted on meat, however, they would be extremely low.

* * * *

Latest Iowa research tests on the use of granular insecticides for corn borer control show that this might be one way to keep the residues low. Tests at Ankeny, Iowa, show that applications of new granular insecticides leave 100 to 200 times less residue on the leaves of corn plants than emulsion sprays and only about half as much residue where leaves join the stalks. Unlike sprayed materials, the granular toxicants do not cling to leaf surfaces, but tend to slide down into the leaf whorls and to the junctures of leaf and stalk, where young corn borers do most of their feeding.

Results of 2-year tests indicate that DDT, EPN, and heptachlor used in granular form give us good, or possibly better, borer control than when used in conventional emulsion sprays.

Thus, granular insecticides may be the answer to the residue problem facing farmers who graze livestock in their cornfields after harvest or put up the stalks and leaves as silage. Toxic residues from insecticide-treated corn may accumulate in the body fat of livestock or be found in the milk of dairy cows when the animals are fed on the treated plants.

* * * *

Dr. G. E. Hilbert, Director of Utilization Research for the USDA, reports another aspect of the residue problem, one that affects international trade. Certainly there are enough barriers to trade without erecting a new one. Residues and food additives were discussed in Vienna under the auspices of the International Bureau of Analytical Chemists. Restriction on the movement of food because of additives and residues is a thorny problem and one not likely to be quickly solved.

Dr. Hilbert reports wide differences in the view points countries take on this problem. France, for instance, permits no additives and no residues. Other countries have no laws bearing on the matter. Still other countries permit thousands of additives and have a very loose enforcement of their laws.

Feeling is that international trade would be increased if a degree of uniformity could be established. Two further meetings are scheduled, one in February at Locarno, Switzerland and another next July in Denmark.

One of the main subjects to come before the Locarno meeting will be the enrichment of flour with vitamins. In the U. S., enrichment dates back many years, with the war making it mandatory under War Food Order

(*Continued on Page* 121)

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Pesticide Recommendations and Research Programs for 1956

By Charles E. Palm

IN providing an extension of the effective date for tolerance requirements on many pesticide chemicals until the end of October, the Food and Drug Administration has clarified pest control recommendations for the current season in most parts of the country. It is gratifying to all concerned with the use of pesticides to be able to finish the 1955 season with recommendations based on the research and field experience gained in 1954. With normal growing conditions and requirements for control practices, growers should get by this year without too many difficulties with residues.

The program for 1956, however, is very much with us. Recommendations made this fall and winter for the '56 growing season will have to conform to the use of those chemicals that in addition to being effective in pest control, will have met the full requirements of the Miller Bill. The extension period adds a few months of grace, so to speak, for getting official tolerances established for those chemicals that had not fully met the requirements by last July 22nd. It is hoped that during this period, the additional data needed for tolerances will be obtained, since it would seem unlikely that an additional extension of time can be expected.

Research and Extension, A Team

It has always been important for research and extension personnel to work together, but now it assumes even greater significance. Regardless of the administrative procedures that govern the relationship between research and extension work in the state, federal and industrial stations, the correlation between field research, and the recommendations that go to growers, must be carefully considered. For example, much of the residue research that has been done in some of the laboratories has been slanted of necessity toward residues from particular chemicals instead of residues at harvest resulting from complete spray programs. These programs vary with different combinations of materials and in different areas.

We need data from the experimental plots where single materials have been used, to compare with data from complete spray programs in which the particular material has been a part. Obviously the latter is the residue picture that most growers will have to consider on fruit and vegetable crops. Most everyone is feeling his way along this path to gain experience for future guidance. It is important, however, for the research worker to have data from his plots as a guide to further investigations, with dates of application, methods of applying the chemicals, formulation studies, interval between last application and harvest and the like. It is important also that the chemist and bio-assay worker responsible for the analytical work have an opportunity to develop methods, sampling techniques, etc., for the different crops that are treated, without the interference from other chemicals.

With the establishment of tolerances for certain classes of chemicals, as for example the chlorinated hydrocarbons, the question of what the spray schedules mean in terms of residues at harvest for a class of chemicals assumes new importance. Seasonal variations in weather will produce different results because the number of applications may vary, as pest abundance, changes in seasonal appearance, or emergency outbreaks of major or minor species enter the picture.

The extension worker is faced with the very real problem of what he can recommend that will do the job in pest control, yet keep the grower within the tolerance limit set for a class of chemicals. It may be true even with a single materials, particularly if infestations develop close to harvest, or if a repeat application is necessary. It will take time and coordination of effort between research and extension to work out this new demand for accurate information.

Within a few years the seasonal variation of results will have been experienced and give us background for sound judgment, where today we may be able only to guess. But even then the problem will not be settled because with progress, new materials and application methods will enter the picture and keep the problem interesting.

More Analytical Work Needed

It has been taken for granted in the foregoing comments that chemical and bio-assay facilities are available to the research workers with insecticides, fungicides and herbicides. Unfortunately this is not true in many of the experiment stations. With appropriations sometimes as much as two years in the future after budget requests—assuming they are granted, it is still a ways in the future before many experiment stations will have adequate residue data obtained under local growing conditions.

With the need for data on fungicides, insecticides, herbicides and some plant growth regulators, for future materials as well as for the ones presently available, residue research will have to be incorporated into the programs of all experiment stations. Without a knowledge of the residues that can be expected at harvest, recommendations cannot be made with certainty and growers themselves can-

(*Turn to Page* 143)

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2 lb. DDT/gal.	2.5%	2 lb. Methoxychlor/gal.	3.0%
1½ lb. Dieldrin/gal.	5.0%	4 lb. Strobane/gal.	5.0%
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LISTENING *Post*

Influence of Antibiotics and other Chemicals on Oak Wilt Fungus

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

CHARLES L. FERGUS, Herbert Cole, Jr., and William J. Stambaugh, of the Pennsylvania Agricultural Experiment Station, studied the effects of various chemicals on growth and spore germination of the oak wilt fungus, *Endoconidiophora fagacearum*. The purpose was to determine whether the development of the mycelial mats that the fungus forms on diseased trees could be prevented. These mats are the primary source of inoculum for long-distance spread of the disease.

The chemicals compared included the antibiotic Acti-dione, Ammate (ammonium sulfamate), sodium arsenite, copper sulfate, and pentachlorophenol.

The basic medium consisted of 1.5 g. Difco malt extract and 1.5 g. agar per 100 ml. of solution. The medium was autoclaved and cooled to 50°C, and sufficient quantities of the various chemicals were added to produce the desired concentrations (Table 1). This method of addition was used to eliminate any possible reduction of toxicity by autoclaving. Aqueous endoconidial suspensions of the oak wilt fungus were obtained from 10-day-old malt extract agar slant cultures. The spore concentration was adjusted to 200,000 per milliliter. One drop of the spore suspension was pipetted onto the center of the plates containing 20ml. of the test media. Each test was replicated five times. The effect of the chemicals was evaluated by checking spore germination after 24, 48 and 72 hours, and growth after 14 days.

The results are presented in Table 1. Acti-dione was the most effective of the chemicals tested. It completely inhibited germination of endoconidia and ascospores at 1.0 microgram per milliliter. The endoconidia were more sensitive than the ascospores to Acti-dione. At the concentration of 0.1 micrograms per milliliter, germination of endoconidia was nil, of ascospores 3 percent. However, the germ tubes of the germinated ascospores failed to continue development. No growth occurred at concentrations of 0.1 microgram per milliliter or greater. At 0.01 microgram per milliliter, growth was reduced about 75 percent. Germination took place at various concentrations of pentachlorophenol, but growth was strongly inhibited at 25 micrograms per milliliter. Ammate was the least toxic of all the chemicals tested; 2000 micrograms per milliliter allowed high germination, but growth was inhibited approximately 50 percent.

Because of the inhibitory effect of Acti-dione in the preliminary test, the antibiotic was tested further in

TABLE I

Growth and percentage spore germination of the oak wilt fungus on agar containing toxic chemicals.[a]

Chemical	Concentration	Percent Germination		Growth
	Micrograms per milliliter	Ascospores	Endoconidia	Diameter (mm.)
Acti-dione[b]	1	0	0	0
	0.1	3	0	0
	0.01	84	86	25
	0.001	90	90	35
Ammate	30,000	38	30	0
	22,000	50	47	17
	10,000	76	78	30
	2,000	90	88	53
Sodium arsenite	250	0	0	0
	25	60	54	60
	2.5	80	79	65
Copper sulfate	500	0	0	0
	250	65	71	40
	25	77	69	40
"Penta"[c]	1,250	0	0	0
	500	3	2	1
	250	9	4	2
	25	14	11	2
Malt extract		87	91	80

[a] Additional concentrations were tested, but only significant values are listed for brevity.
[b] Trademark of the Upjohn Company for cycloheximide, material for testing supplied by the manufacturer.
[c] Commercial preparation by Chapman Co. containing 5% pentachlorophenol in hydrocarbon

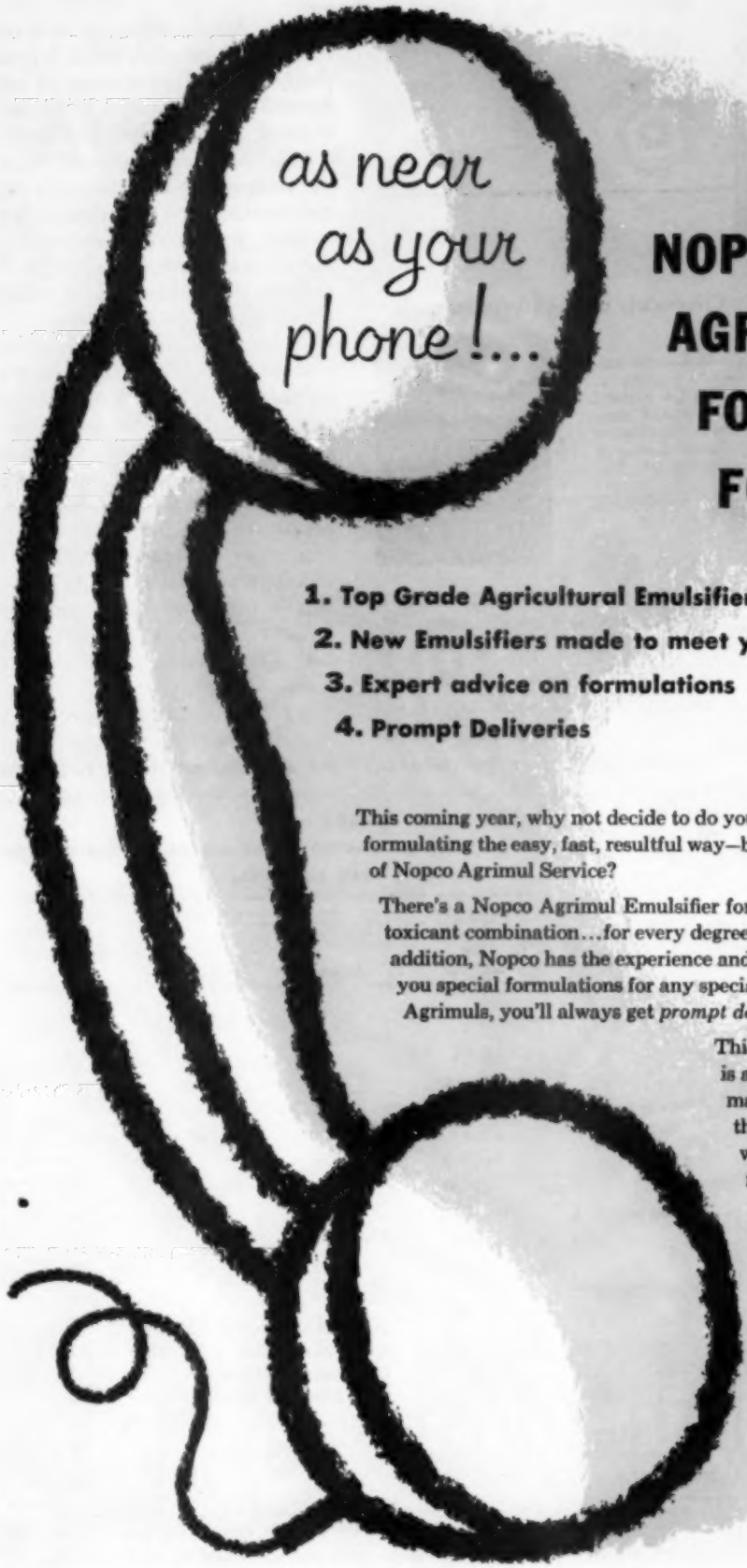

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TABLE 2.
Effects of Acti-dione on colony diameter increase of the oak wilt fungus on malt extract agar plates

Treatment micrograms per milliliter	Colony diameter increase (in mm.) 7 days after treatment	14 days after treatment
Acti-dione		
0.1	17 x 20[a]	35 x 35[a]
1	5 x 9[b]	10 x 15[b]
10	2 x 2[b]	2 x 5[b]
100	0	0
Control	20 x 25	37 x 37

[a]Some aerial growth.
[b]Growth increase mostly by spread under the agar surface.

liquid culture against previously established growth. The basic medium consisted of 100 ml. of 1.5% Difco malt extract in 250 ml. Erlenmeyer flasks. The flasks were inoculated with 0.1 ml. of spore suspension (200,000 spores per ml.) and incubated at 25°C for 5 days. Acti-dione was then added to produce concentrations of 0.01 and 0.001 micrograms per milliliter. Fungus growth in these flasks was checked against growth in the basal medium alone. Three flasks of each of the three series were removed at 10, 15, 20, 25, and 30 days, the mycelium was filtered, and the oven-dry weight of mycelium was determined for each flask. Growth of *Endocondiophora fagacearum*, in malt extract solution, although it was well established (20 milligrams dry weight) when the Acti-dione was added, was inhibited 76 percent at the 0.01 microgram rate and 60 percent at the 0.001 microgram rate, after 30 days. The controls contained 185 milligrams dry weight mycelium at the end of the experiment.

Acti-dione was also tested as a spray on previously established fungus growth on oak sapwood and on malt extract agar. Padless mycelial mats of two different Pennsylvania isolates were obtained on healthy red oak sapwood slants placed on end in Erlenmyer flasks containing wheat bran broth. The two isolates used yielded growth more similar to mat growth in nature than any others of ten isolates tested. Endoconidial and ascosporic mats were scribed into two equal sections; one-half of each was sprayed with Acti-dione with a DeVilbiss No. 15 atomizer, while the other half served as a control. Each group was atomized sufficiently to produce an intact film of Acti-dione solution over the mycelium. After 24 hours, one mycelial disc was removed from the control portion, and two from the treated portion of endoconidial mats with a sterile cork borer. Each disc was macerated in sterile water. Germination was tested on malt extract agar. Ascospore masses were tested in the same way. The Acti-dione did not affect germination of endoconidia or ascospores, and transplants of atomized mycelium grew normally on malt extract agar.

The effect of Acti-dione in various concentrations applied by atomizing onto 7-day-old colonies on malt extract agar is presented in Table 2.

(*Continued on Page* 131)

Boll Weevil Activity Increases; Corn Borer Threat Continues

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

IN almost every section of the Cotton Belt where boll weevils are known, there has been a decided increase in the pest. Rains throughout most of the area have provided succulent cotton growth and ideal conditions for boll weevil increase. In many sections, control was difficult because of rank growth and continued rain. In Texas, heavy infestations were reported during early August from the southwest, south central, east, central, north central and northeast areas of the state. Six treated fields checked in McLennan and Falls Counties averaged 45 percent punctured squares, while five untreated fields averaged 80 percent. The highest infestation counts in Louisiana came from the Tallalah area, where three fields had over 50 percent infestation. The average of the 118 fields examined was 19 percent. There was a noticeable boll weevil increase in Oklahoma, Arkansas and Tennessee. In the Stoneville area of Mississippi, fields examined ranged from 1-100 percent infestation with an average of 32 percent. Populations, if not controlled, were high enough to destroy most of the fruit. Fifty fields in eight western Alabama counties averaged 23 percent infestation. In 80 treated fields in northern Georgia the infestation averaged nine percent, a sharp increase over the previous report. Counts in 43 treated fields in Darlington County, S. C., averaged 74 percent square infestation. Four treated fields in Florence County averaged 57 percent, while four untreated fields averaged 97 percent. Of 143 treated fields checked in North Carolina, 138 were found to be infested with boll weevil. All counties reporting, except Johnston and Northampton, had over 10 percent of bolls punctured, with the highest infestation being 75 percent in Scotland County. Untreated fields inspected ranged from 14-100 percent boll infestation. Virginia also reported square infestation, with inspected fields showing 20 percent in Southampton County, 11 percent in Greens-

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ville and 7 percent in Brunswick.

Bollworms were also of primary concern to cotton growers in several states. These insects were the major cotton pests in Pinal and Pima Counties, Arizona, and were on the increase in Maricopa. Control was necessary in many fields. Infestations were heavy in Chaves County, New Mexico and occurred in other cotton growing regions. Texas reported the insect to be heavy in succulent cotton over the state. Bryan County, Oklahoma, had the heaviest outbreak since 1950. The insect was also on the increase in California, and Arkansas.

Spider mites were on the increase in Texas, Arkansas and North Carolina.

Of the fruit insects, codling moths and spider mites appeared to cause the most concern during late July and early August. The codling moth was on the increase in Rockland County, New York. New Jersey and Indiana were expecting more than the ordinary number of entires. Mites were on the increase in areas of New Mexico, Illinois, New York, New Jersey and Maryland.

Screw worms in late July were reported to be heavier than normal over the entire State of Texas. Several cases were reported from Louisiana, and in early August cases were reported from the Ottumwa and Fort Dodge, Iowa, areas.

European Corn Borer Threat Continues

THE European corn borer continues to be a rather serious threat in some areas. Illinois may have the largest population of second-generation borers on record for the state, and damage may also be the greatest. By early August, egg masses were 50-100 per 100 stalks, with counts in some fields reaching 500 masses per 100 plants and more egg laying expected, probably into September. Egg mass counts were highest in Woodford, Livingston, Ford and adjacent counties. In Iowa, moths have been flying for the past month, and second-brood egg masses have accumulated to a total of 70 masses per 100 plants in some areas. Third instar larvae are present in some fields, with possible overlapping of a second and partial third brood. The second brood is expected to be rather general over the state in corn of practically all planting stages. The situation in Wisconsin is attracting more attention than usual this year. Early corn is expected to receive serious injury, with some counts running more than 100 borers per 100 stalks. By early August, the second brood was just beginning to hatch. The highest infestation in Minnesota was in the southwest district. Most emergence in the state had been slow but was expected to increase by the middle of August. A long egg laying period is indicated in North Dakota. First-generation pupation averaged 10 percent in the southeastern area, with 75-90 borers per 100 stalks. In the central and eastern counties of South Dakota, the average was about 37 borers per 100 plants, with 66 percent being in the fifth instar. The first egg laying was expected in Nebraska during the week of August 8. The larval instars ranged from one to five in late July, so a prolonged egg laying period can be expected. Reports received from the eastern states indicate a rather low population. The finding of the European corn borer in some additional Alabama Counties is causing small concern. Recent surveys revealed the borer for the first time in the Alabama Counties of: Blount, Cherokee, Colbert, DeKalb, Franklin, Jackson, Lawrence, Limestone and Morgan. The insect has also extended its range into Arkansas.

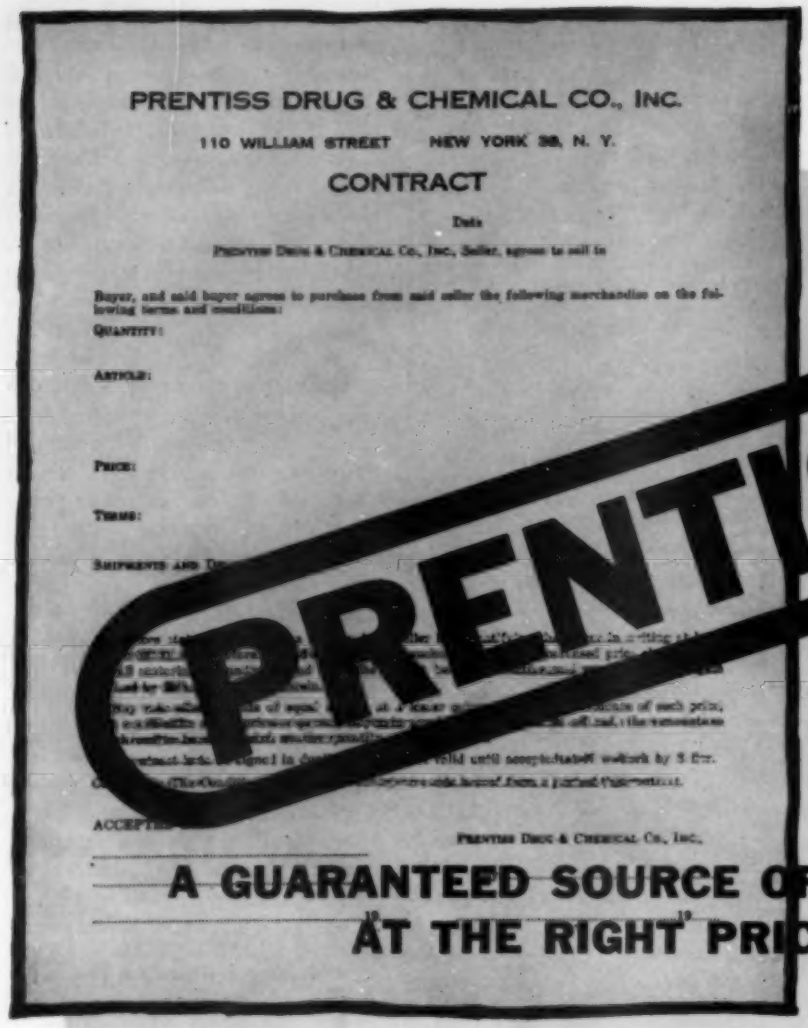
A serious infestation of gypsy moths in New Jersey was reported late in August along the northern borders of Bergen, Passaic and Sussex counties . . . and their presence indicates that new colonies are building up in New York State. Dr. Harry B. Weiss, director of the Division of Plant Industry of the State Department of Agriculture, reported that unless outbreaks in the neighboring states of New York and northeastern Pennsylvania, close to the New Jersey border, are not controlled, New Jersey will have a serious threat from the gypsy moth.

The corn earworm (*Heliothis armigera*) has been abundant in early sweet corn throughout the southern area of Wisconsin. All of early sweet corn has been damaged and considerable damage threatens field and late sweet corn. Southern Delaware had a moderately heavy infestation in most sweet corn, and Maryland reports heavy damage in some fields in Montgomery and Baltimore Counties. New Jersey, Virginia, North Carolina and New Mexico also report serious corn earworm damage in local areas. Corn growers in eastern Colorado were concerned about existing infestations. In some Logan and Providence, Utah, areas, cornfield damage exceeded 50 percent. The Gilbert, Arizona, area, reported 50 percent ears infested. This insect is also causing damage to grain sorghums in several states. In Texas, sorghums were being attacked in Tom Green, Lamar, Schleicher, Denton and Bell Counties, as well as other local areas. Up to 14 larvae per sorghum head were recorded in the central Arkansas River Valley. On the encouraging side, however, were reports from Idaho and Massachusetts. Southeastern Idaho had the lowest counts in four years, with the highest infestation being two earworms per 100 ears. The infestation was lighter than usual in southeastern Massachusetts.

Grasshoppers Continue Problem

THE cooperative program for the control of grasshoppers on rangelands has just about been completed, with over one and one-half million acres being treated; infestations in crop lands, however continue in some areas. Grasshoppers have been rather general in Missouri during the season; and during early August, heavy damage to several crops was reported in the west central, northwest and northeastern areas of the state. Disease and parasites have contributed to reduce populations in the central and south central areas. Grasshopper populations have been heavy throughout Minnesota. In the southwestern area, populations in orchard cover crops were threatening new trees, . . . in some fields, in the northwestern area, up to 25 percent of the alfalfa had been destroyed by early August.

(*Continued on Page 121*)



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Amino Triazole: A New Herbicide, Growth Inhibitor, and Defoliant

AMINO Triazole, a new systemic weed killer, defoliant and growth inhibitor is available in limited amounts for trial use only, from American Cyanamid Co., New York.

Some of the hard-to-control weeds against which Amino Triazole has shown promise are:

Nut Grass—Tests have shown that foliage application of Amino Triazole will readily translocate into the chain system of nut grass up to the third or fourth nut. Fields infested with nut grass are disced in the spring to tear apart the chains of underground tubers and encourage vigorous sprouting. When new growth appears, Amino Triazole sprayed on these new shoots is absorbed into the plant and carried down into the roots (or nuts) killing them. As it is impossible to get all the nuts or tubers to grow at the same time, repeat cultivation and treatment will be needed for satisfactory control.

Canada Thistle infests thousands of acres of fertile land in the U.S. Research has found that thorough spraying of thistle when plants are several inches high or approaching bloom stage has given excellent control. Treatment at an earlier growth stage or on mature plants was less satisfactory. In tests applied at Purdue University last spring, thistle sprayed with Amino Triazole showed dead roots a foot underground by fall. For this reason plants should not be mowed or disturbed for some time after spraying since all the Amino Triazole might not have gotten down to the roots.

Quack Grass—In work last season on the control of quack grass in corn, Dr. S. M. Raleigh of Pennsylvania State University reports, "The indications are that for best results with Amino Triazole, applications should be made on the quack grass sod in the spring, 10 to 20 days before planting corn. Then plow, disc, and plant corn immediately. The new herbicide translocates rapidly and slows down the rate of growth of the quack grass so it is easily killed by cultivation."

Horsetail rush—Tests on this deep rooted, persistent perennial show Amino Triazole to be one of the most effective chemicals yet tried. In one series of tests last summer, Amino Triazole was applied to 8" high Horsetail in July and only a very few plants showed regrowth in late fall. Roots were dead to a depth or at least one foot.

Poison Ivy, Poison Oak, Ash and Scrub Oak—Sprayed when in full leaf, these plants have proven susceptible to Amino Triazole. Tests have shown good control in the spring of the year following treatment. Botanists from the University of California have reported that it appears to be more selective than present poison oak killers such as 2,4-D, 2-4-5-T and oil sprays, and may prove safer in use in areas where ornamentals grow nearby.

Tested as a cotton defoliant, the Amino Triazole herbicide is reported to defoliate and at the same time suppress or retard second growth of the cotton plant. Experiments conducted in the South and Southwest have demonstrated that Amino Triazole increased defoliation efficiency when added to any of several commercial defoliants, and following defoliation, inhibited or reduced the regrowth of new foliage.

No harmful effect upon cotton yield, fiber properties, boll characteristics or seed viability was noted. The chemical can be added to the older defoliants—cutting the rate of both to increase defoliation, and at the same time add the property of retarding second growth. One of these combinations reported to be particularly successful in 1954, was a combination of Amino Triazole with sodium ethyl xanthate (commonly called S.E.X. Cotton Defoliant).

Amino Triazole is absorbed into the sap stream of the plant. Its exact action within the plant is unknown, but the apparent action is a slowing down of the growth processes. It affects the mechanism of many plants for producing chlorophyll. New growth put out after an application

This cotton field was defoliated at the same time. Amino Triazole effectively prevented second growth in area at left while plants at right which received no Amino Triazole sent out new set of leaves. New growth complicates mechanical harvesting — crushed leaves stain fiber.

of the chemical grows more slowly (eventually ceasing growth altogether) and is either white or a very pale greenish or reddish color.

Unlike most herbicides which kill fairly rapidly after application, Amino Triazole works slowly. Woody plants such as ash or scrub oak may show no striking effect the year they have been sprayed. Although plant growth does slow down or stop, the leaves remain green and the plants appear more or less normal through the season. But the following spring they fail to send out normal growth and finally die. *Cyanagrams*, Summer, 1955.

•

Vitamin C Value of Potatos

Fertilizers applied at the rate of 120 N, 60 P, and 90 K lbs. per acre, and at various other ratios were shown to affect the ascorbic acid value of potato tubers at all ages of sampling, in tests conducted in India. N and K are complementary and omission or reduction of either lowers the ascorbic acid content. K. Kumar and K. P. Sinha, *J. Scientific Research* Banara Hindu Univ. (India) 5, 139-42 (1945-55); through *Chemical Abstracts*, Vol. 49, No. 11.

•

Corn Suffers From Zinc Lack

Corn tends to grow out of mild zinc deficiency but yields are seriously reduced where the deficiency is severe, according to results of experimental work done by the Experiment Station at University of Tennessee. Symptoms are most pronounced where heavy applications of limestone have been made on high phosphate soils. Second leaves show a yellow streaking, and as the plant grows older, chlorosis becomes definitely interveinal; tips, margins and sheaths of the older leaves begin to develop a purplish color.

Zinc sulfate mono-hydrate was used to feed zinc to deficient areas, at a rate equivalent to 1.8 to 10.8 pounds of zinc per acre. Spray applications were also tried on chlorotic corn. About 10 pounds per acre was adequate to relieve symptoms in these studies. *Tennessee Farm and Home Science*, April-June, 1955.

Antibiotics for Fire Blight

Fire blight has caused as much as 40 percent of an apple crop to rot before harvest when not checked. Control of this bacterial disease has been gained by the use of streptomycin sprays applied during bloom in North Carolina apple orchards.

After three sprays of streptomycin at 100 parts per million, only 10 percent as much blight developed compared to more than 50 percent damage of spur and terminal shoots on untreated trees.

A recommended spraying schedule is to apply the first spray in the late pink stage before many of the center blooms open. Apply the second spray five or six days later, and the third when petals start dropping, or five to seven days after the second application. Stop Fire Blight, *Research and Farming*, Winter and Spring, 1954.

•

Answer to Pear Disease

Blossom blast and twig dieback of pears can be prevented with a fall foliage spray of borax or "Polybor" and water. This pear disorder, which has troubled the southwestern Washington grower for 25 years, has been found to be caused by boron deficiency.

Washington Agricultural Experiment Station scientists, who recently discovered both the cause and the cure, say that now, for 50 cents worth of chemicals per acre, the disease can be controlled completely.

Suitable sprays contain 3 pounds of borax or 2 pounds of "Polybor" in 100 gallons of water. Fall sprays—after harvest—give best results. Soil treatments and early summer sprays gave erratic control.

Bartlett, Anjou, and Bosc varieties of pears are susceptible to the disease. When infection is severe, blossoms shrivel and die, and the young leaves forming on new season's growth fall off. Entire branches may dieback.

According to the scientists, the disease is not so much a matter of lack of boron in the soil, but a lack of moisture, which apparently helps make soil boron available to the trees. Disease symptoms are usually worst after a dry year; least apparent after a year of normal or above-normal rainfall.

•

Fungicide for Turf Diseases

Rhode Island Agricultural Experiment Station, Kingston, R. I., announced in July the development of a "one-shot" product that will "apparently" control all major diseases of turf. It will be on the market nationally early in 1956, the station states.

Called a "broad spectrum" fungicide by its developers, Dr. F. L. Howard and Miss Barbara J. Champlin, research plant pathologists, this new product is said to be effective against all major fungus groups in the turf disease spectrum, yet does not injure the turf.

The new broad-spectrum fungicide is a combination of compatible chemicals, effective at a low rate of application and, according to the Station, can be manufactured at a reasonable cost.

In addition to its use for turf disease control, it is suggested that the new chemical may be found useful in controlling fungus diseases of other crops.

•

New Control for Snow Mold

Snow mold disease of turf can be controlled effectively with applications of new phenyl mercuric fungicides. Dr. Jack P. Meiners, plant pathologist at the Washington Agricultural Experiment Station, reports that three years of tests have proved that good protection against the disease can be gained with PMAS, phenyl mercury acetate Solubilized No. 10, Puraturf, and Tact-C-Lect.

Dr. Meiners describes snow mold as one of the most destructive turf diseases of the Pacific northwest. It is most common in eastern Washington, northern Idaho, and western Montana where snow covers turf for long periods. Lent grass turfs—such as those of golf courses, cemeteries, and home lawns—are particularly susceptible to the disease.

Dr. Meiners suggests that any one of these materials be applied as a

(*Continued on Page* 81)

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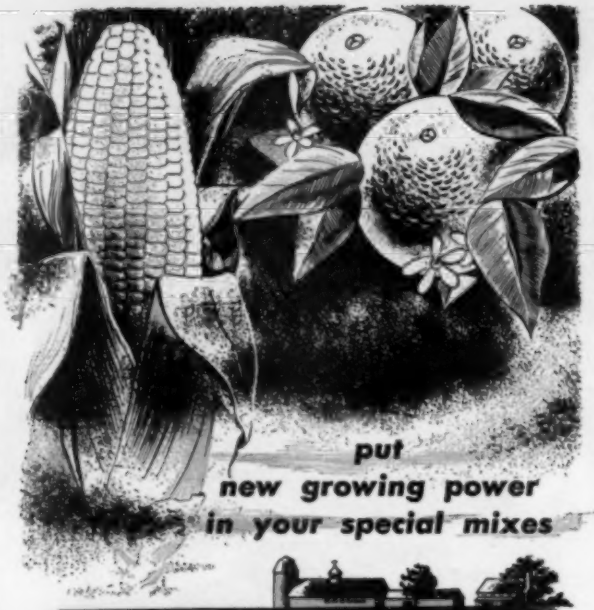

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spray in mid-November at the rate of 2 ounces per 1,000 square feet. Diluting the chemical with ½ to 5 gallons of water in mixing the spray, does not alter its effectiveness.

Another of the new fungicides that appeared promising in Dr. Meiners' tests was Cadminate, a cadmium compound. Although not quite as good as the mercurial acetates in controlling snow mold disease, Cadminate's success against dollar spot disease recommends its use as a dual purpose spray: to control a late infestation of dollar spot, and at the same time, prevent an early infestation of snow mold.

Dr. Meiners' research has shown that snow mold is associated with two fungus organisms working either singly or together. One of the organisms, *Typhula itoana*, causes snow mold only when the turf is covered with snow. The other, *Fusarium nivale*, can cause the disease to develop both under snow, and during cool, moist periods in fall and spring.

Research was cooperative with the National Cooperative Turf Fungicide Trials, the American Phytopathological Society, and the Pacific Northwest Turfgrass Association.

•

Potatoes Helped by Antibiotics

Potato seed-pieces treated by instant dips in a solution of Agrimycin (100 parts per million) reduced the amount of seed-piece decay, generally increased the emergence rate, reduced the percentage of black leg, generally improved the color size and vigor of the plants, and increased the yield. Instant-dip treatment seemed to be just as effective as the 30-minute soaking in reducing seed-piece decay and blackleg.

In 1954 experiments on Maine farms, from five to ten percent of the untreated seed-pieces on all of the farms had a shallow surface spotting caused by bacteria. Increases in yield noted on the treated plots varied from 7 barrels per acre with instant-dip treated seed-pieces to a 26-barrel per acre increase from the 30-minute soaked seed pieces. What's Ahead for Agricultural Antibiotics?, Reiner Bonds, *Maine Farm Res.*, April, 1955.

New Chemical Intermediate is Fungicide, Insecticide

Cyanuric chloride, (2,4,6-trichloro - 1,3,5-triazine) when used as an intermediate for making several compounds, has shown good fungicidal and insecticidal properties.

Preliminary studies at Boyce Thompson, Yonkers, N. Y., and Batelle Memorial Institute, Columbus, Ohio, have shown that the derivative 2,4-dichloro- 6 -(o - chloroanilino) - s triazine is effective against early and late tomato blight fungus, apple scab, celery early blight, muskmelon leaf spot, onion foliage diseases, leaf diseases of ornamentals, potato late blight, tomato anthracnose, dollar spot and turf diseases.

Cyanuric chloride has been used to prepare triallyl cyanurate which, when dissolved in a solvent of acetone or an aqueous solution of acetone, and sprayed at 0.1 percent, gave 100 percent control against the black bear aphid. *Aero Cyanuric Chloride Booklet*, American Cyanamid Co., July, 1955.

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A three component mixture of liquid nitrogen fertilizer, 2,4-D and an ordinary laundry detergent has been successfully used as a contact weed killer on horse nettle, trumpet vine, cocklebur, morning glory and smartweed. Growth of Bermuda grass was slowed but the weed was not killed. North Carolina Agricultural Experiment Station tested the mixture during 1953 and 1954 on corn plantings, applying a 2,4-D pre-emergence weed control spray to the soil before planting; then adding 80 pounds of nitrogen per acre (35 gallons of "Solution 60" mixed in ¾ pound of detergent and ⅛ pound low-volatile ester 2,4-D).

Results of the 1953 tests indicate:

(1) Yields were higher on sprayed plots, probably due to better weed control.
(2) Corn yields are just as high with liquid ammonium nitrate as with solid forms.
(3) DuPont M controlled weeds for 5-8 weeks, compared to four weeks for 2,4-D.
(4) After a hurricane, sprayed plots had only 58 percent broken stalks, compared with 74 percent in the solid ammonium nitrate plots.

New findings reported in 1954 show that with normal rainfall, weed control is better with liquid nitrogen than with present methods. Also, Karmex D controls weeds in corn better than 2,4-D. Liquid Nitrogen Doubles as Weed Killer, *Research and Farming*, Winter and Spring, 1954.

•

Control For Lace Bug

The Andromeda lace bug can be effectively controlled by any one of eight insecticides. Experiments in control of this pest are reported in a Circular 194, of The Connecticut Agricultural Experiment Station, New Haven, Conn.

John C. Schread, entomologist at the station, says that a single spray applied between May 25 and June 1 may be expected to control the lace bug for the entire season. When treatment is delayed, additional sprays may be necessary.

The materials found effective in Mr. Schread's experiments were DDT, lindane, heptachlor, endrin, chlordane, aldrin, and dieldrin. All gave excellent control. Malathion may also be used, Mr. Schread points out.

The concentration of spray mixtures that control the Andromeda lace bug is 1 pint of emulsifiable concentrate in 100 gallons of water, equivalent to about 1 teaspoon in 1 gallon. Wettable powders may be used at the rate of 1 to 2 pounds in 100 gallons of water, 2 to 4 teaspoons in 1 gallon. Thorough coverage of the lower as well as upper surface of the leaves is essential for complete control.

•

Effective Fall Fertilization

Fall surface-applications of nitrogen salts to winter grains and grasslands are not as effective as spring applications, unless intended for fall grazing; but good results from fall applications equal to those obtained from surface applications of nitrogen salts in early spring can be had by deep applications of ammonium nitrogen for fall-seeded grains, out of the reach of the young roots. The nitrogen should be kept away from the crop until a good root structure has been developed.

Maps showing topography, precipitation, precipitation - evaporation ratios, natural vegetation, and soils are a help in deciding where fall application of nitrogen is desirable.

Recommendations for nitrogen applications in specific areas of the U. S. include:

a) In the plains and prairie states, ammonium forms of nitrogen can be put into the average soil without serious loss in late fall or early winter.

b) In the southern coniferous forests, where high rainfall, high winter temperatures and sandy coastal plain soils are the conditions, nitrogen should not be applied in any form unless a crop is there to use it. The major part of the nitrogen should be applied as top-dressing or side-dressing after the crops are well under way.

c) In the region east of the prairies and north of the Pennsylvania-Maryland boundary line, ammonium forms of nitrogen can be added to the soil without serious loss in drainage, to fall-sown small grains and for grass pastures and haylands.

d) The region from Ohio and Pennsylvania south to the coastal plain areas along the Atlantic Ocean and the Gulf of Mexico is not a suitable one for fall application of large amounts of nitrogen for spring-planted crops. Top-dressing fall pasture and cover crops is recommended.

Where Fall Fertilization Pays Most, Firman E. Bear, *Agricultural Ammonia News*, July-Sept., 1955.

Book Reviews

Vegetable Production and Marketing 2nd edition. By Paul Work and John Carew. Published by John Wiley & Sons, New York, 537 pages, price $4.75.

This revised edition includes material on vegetable varieties, insecticides and herbicides, hormones, and the latest cost research and experimental station findings. The authors emphasize the inherited characteristics of crop plants and their responses to various environmental conditions, in order to lift their treatment above regional restrictions.

Commercial Fertilizers, by Gilbert H. Collings. Published by McGraw-Hill Book Co., N. Y. 6 x 9 inches, cloth binding, 617 pages. Price $8.25.

This is the fifth edition of the text on the sources and uses of fertilizer raw materials and the production and use of manufactured mixed fertilizers. It takes into account changes that have occurred in fertilizer production, consumption and research since the last edition was published. Latest information about plant life processes is included.

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A Review of Toxicologic Considerations Pertinent to the Safe Use of 2, 2,-bis (p-chlorophenyl)-1, 1-dichloroethane (TDE, DDD, Rhothane)

by H. B. Haag and Carlos Kampmeier

Medical College of Virginia, Richmond, Va.

Rohm & Haas Company Philadelphia, Pa.

THE compound 2,2-bis- (p-chlorophenyl) -1,1-dichloroethane, also known as TDE or DDD and marketed commercially as Rhothane® although closely related chemically to DDT shows marked biological differences; e.g., it is highly effective against certain insects of economic importance which DDT does not control, notably the apple red banded leafroller and the tobacco hornworm. Similarly, important toxicologic differences exist between DDT and TDE.

In the use of any insecticide on plant crops, two potential hazards arise. The first is the possibility of injury to the agricultural worker who handles such materials, and the second is the possibility of injury to the consumer of crops bearing the material as spray residues. These two phases are dealt with separately below.

Potential Hazards in Handling

(*a*) *Acute Oral Toxicity*

DATA on TDE, available for the rat (1, 2), indicate an approximate oral LD_{50} of 3400 mgm. per kgm. The comparable value for DDT is 250 mgm. per kgm. (2). Translated to man, the estimated fatal dose is given as 300 gm. for TDE and 30 gm. for DDT (3). In the case of TDE, onset of symptoms in experimental animals occurs within 24 hours and lasts 2 to 4 days. If death has not occurred by the fourth day, the prognosis appears to be favorable. In contrast, symptoms from DDT appear within 30 minutes and last about 24 hours. Convulsive phenomena from TDE is not a major symptom, whereas with DDT, extreme excitability, tremors, twitching and convulsions precede coma and death.

Data for TDE (4) and DDT (5, 16) on the mouse indicate respectively LD_{50} values, comparable to those for the rat.

(*b*) *Percutaneous and Dermal Toxicity*

Single acute exposures of the skin of the rabbit to TDE as the dry technical powder indicate the LD_{50} to be in excess of 400 mgm. per kgm. (6). Some symptoms of poisoning developed but there were no deaths.

As a 20 per cent solution in dimethyl phthalate, the approximate LD_{50} of TDE for rabbits by single acute 24 hour exposure has been reported as 1200 mgm. per kgm., the value for DDT being listed as 2820 mgm. per kgm. (6). In the case of TDE, hyperexcitability and convulsions preceded death. Because this is so distinctly at variance with the relative toxicities by acute oral administration as given above, as well as with data on toxicity from repeated daily application to the skin, given below, the following additional experiment has recently been made and is reported here (7). TDE and DDT, as 30 per cent solutions in dimethyl phthalate, were compared as regards acute percutaneous toxicity (24 hour exposure) by the Draize girdle technic. Young male albino rabbits were used. The results are summarized in the table below.

At the 4.5 gm./kgm. dose there was considerable unabsorbed residue at the end of 24 hours, but at lower dosages absorption appeared to be essentially complete. Tremors were observed at all dose levels of DDT, but only at the 4.5 gm./kgm. dose of TDE. Convulsions were never observed. Average time of death was about six days after treatment with TDE and eight days after DDT. The flat character of the dose-mortality curves does not make feasible the calculation of LD_{50} values. However, these results point to a less acute percutaneous toxicity for TDE than for DDT.

As a 30 per cent solution in dimethyl phthalate inuncted daily into the skin of rabbits for 3 months, TDE was found by one group of investigators to have a lethal effect at a dose of 900 mgm. per kgm. of active material per day, but produced no externally visible effects at 600 mgm. and lower doses (8). At 150 mgm. doses no histopathologic changes were found, but at 300 mgm. and higher amounts, fatty degeneration and necrosis of the liver occurred. With a 30 per cent solution of DDT in dimethyl phthalate the lethal level was 150 mgm. per kgm. per day, 75 mgm. doses sufficing to produce symptoms of intoxication.

Other studies on repeated daily exposure of the rabbit to dermal application of a solution of TDE in dimethyl phthalate are reported as showing lethal consequences to 400 mgm. per kgm. doses and severe symptoms to 200 mgm. (6). Repeated exposure to 150 mgm. per kgm. doses of DDT caused death (6, 9).

(*Continued on Page 123*)

TDE and DDT as 30% Solutions in dimethyl phthalate are compared as regards to acute percutaneous toxicity (24 hour exp.)

Compound	Dose (gm of material per kgm. body weight)	Number rabbits treated	Number rabbits dying
TDE	1.5	10	1
	3.0	10	2
	3.6	10	1
	4.5	6	4
DDT	1.5	10	5
	3.0	10	3
	3.6	10	5
	4.5	6	4

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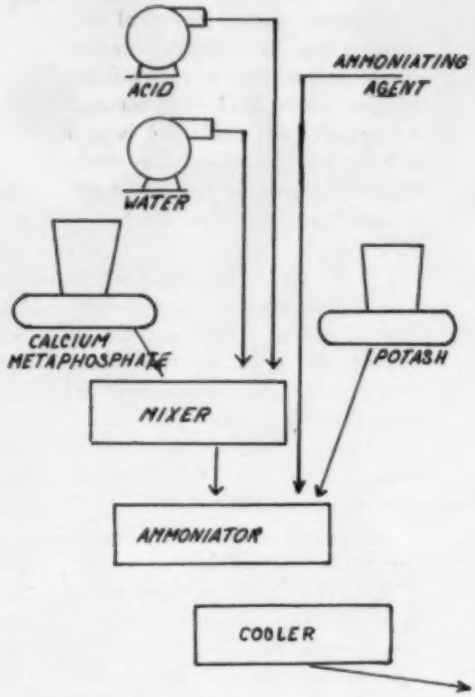
Processes to Manufacture Granulated Concentrated FERTILIZER From CALCIUM METAPHOSPHATE



By James E. Seymour*
Illinois Farm Supply Co.
Chicago, Illinois

WITH the nation's major phosphate resources located in the west, midwest agriculture will, in the future, look largely to these western deposits for its source of phosphate. The nature of the western deposits and their location near potential hydro-electric power make the electric furnace process the most efficient means of extracting phosphorus. The elemental phosphorus can then be converted into a myriad of compounds, including phosphoric acid for the fertilizer industry.

A process for the commercial production of calcium metaphosphate, which is a highly concentrated phosphatic fertilizer material, from elemental posphorus and phosphate rock has been developed by the Tennessee Valley Authority. It is a white, vitreous, ammonium citrate soluble, water insoluble compound, with a P_2O_5 analysis ranging from 60 to 65%. This high concentration, together with the non-hazardous nature of the material make the economics of shipping it long distances very favorable. The product has proven suitable for a phosphatic fertilizer on acid soils. On basic or neutral soils, it is less efficient. As a phosphatic fertilizer material, much of the TVA produced calcium metaposphate is being used for the dry blend manufacture of high analysis mixed fertilizers or for direct soil application.

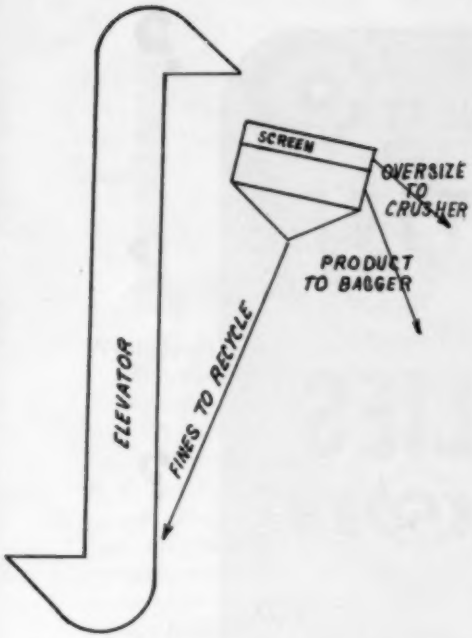
The production of calcium metaphosphate from western deposits is under study by several of the phosphorus producers. Among the organizations considering expansion in this direction is Central Farmers Fertilizer Co., which is engaged in the development of plans to produce elemental phosphorus and convert it to calcium metaphosphate from the phosphate rock contained in their property near Georgetown, Idaho. This western produced calcium metaphosphate is an ideal raw material for the production of high analysis granular mixed fertilizer and semi granular enriched super-phosphates, by the use of the "Seymour Process" developed by Illinois Farm Supply Company. This process makes it possible to convert the calcium metaphosphate to various grades of mixed fertilizers and enriched superphosphates.

The "Seymour Process" consists of a number of processes or methods of converting metaphosphates into high analysis fertilizers. Some of these processes produce completely water soluble fertilizers. Most of the process products are granular or semi-granular. It is possible to produce any common "P," "P-K," "N-P" or "N-P-K" ratio fertilizer by the correct selection and utilization of one of these processes.

The Seymour Process is based on the hydrolysis of metaphosphate, and although the hydrolysis reaction is not a recent discovery, prior work on metaphosphate hydrolysis had not indicated that this reaction would be adaptable to commercial fertilizer practices. Extensive laboratory and pilot plant work over recent years by Illinois Farm Supply Co. has resulted in discovery of a number of ways by

*Paper presented at the American Farm Research Association Conference at St. Paul, Minn., July 15, 1965.

THE SEYMOUR PROCESS
FOR MIXED FERTILIZER



which metaphosphate hydrolysis can be employed under conditions readily obtained in the fertilizer industry.

PROCESS A-1

Enriched Superphosphates

THE production of higher analysis fertilizers at low cost can partially be achieved by producing high analysis phosphatic products (capable of chemically absorbing ammonia) at a lower cost per unit of plant food than the conventionally produced enriched superphosphates, triple superphosphate or combinations of normal and triple superphosphates now being used to manufacture the more concentrated mixed fertilizers.

Enriched superphosphates may be produced by reacting various combinations of calcium metaphosphate, rock phosphate dust, sulfuric acid and water with subsequent mechanical or physical processing. The product should be conventionally "bin" or "pile"-cured to promote substantial conversion of the rock phosphate.

The Illinois Farm Supply Co. has experimentally manufactured these enriched superphosphates in conventional superphosphate equipment. The product range indicates extreme operational flexibility.

Although enriched phosphatic products ranging from an 0-21-0 grade to grades in excess of 0-50-0 have been prepared in the laboratory, production efforts in conventional process equipment have been confined to the median portion of the range. Illinois Farm Supply has manufactured those grades that could be used easily in the manufacture of specific grades of mixed fertilizers. These enriched supers reflect a savings of approximately 14¢ per unit of P_2O_5.

One formulation for an 0-30-0 is as follows:

		% by Weight
Calcium metaphosphate	(64%)	23.39%
Rock phosphate	(75% B.P.L.)	42.08%
H_2SO_4	(58° B.E.)	34.51%
Surfactant	(Sterox AJ)	.02%
		100.00%

An examination of the flow diagram of Figure 1 shows the general details of the process. The rock phosphate dust, sulfuric acid, calcium metaphosphate, and water are intimately mixed in the acidulator. Primary chemical reactions occurring in the acidulator are: hydrolysis of the calcium metaphosphate, the subsequent acidulation of the calcium metaphosphate hydrolysis product, and the conventional acidulation of rock phosphate. The hydrolysis of the calcium metaphosphate is promoted by the presence of sulfuric acid and water, the heat of solution of the sulfuric acid, and heat of reaction of the acid and rock phosphate.

It is interesting to note that the sulfuric acid it not "used up" by the hydrolysis reaction but rather, with respect to that reaction, acts only to promote hydrolysis. The hydrolysis reaction runs concurrently with acidulation of the rock phosphate. With proper formulation and process conditions, hydrolysis is initiated quickly and proceeds rapidly, even though the sulfuric acid content of the reaction mixture soon begins to decrease as the rock phosphate is acidulated. Of course, the product of hydrolysis is monocalcium ortho-phosphate. This hydrolysis product will react with the sulfuric acid to produce two moles of phosphoric acid for each mole of sulfuric acid used up. The reaction mixture is then transferred to a "den" (either batch or continuous). Further reaction between the rock phosphate and acid, moisture loss, crystallization of the products, and gaseous product evolution occur during the "denning" phase of the operation. Subsequent processing involves conventional excavation, transfer, and "pile" or "bin" cure of the product. The "denning" phase of the process can be eliminated by the selection of proper process equipment and the incorporation of a recently discovered process technique. Basically, the operable process is dependent upon the hydrolysis of calcium metaphosphate.

The process offers the following advantages:

1. Reduces operational manufacturing problems.
2. Reduces the material or ingredient cost per unit of plant food.
3. Some enriched grades reduce both manufacturing cost per unit of plant food and transportation costs per unit of plant food.
4. The process is adaptable to and operable in conventional acidulation equipment.
5. Improved product quality—due to semi-granular composition (at no extra expense,) low moisture content (the free moisture is utilized by hydrolysis of the calcium metaphosphate,) and permeability.
6. Conservation of national sulfur resources.
7. Elimination of the "denning" phase of the proces in manufacturing units to be constructed in the future.

PROCESS B-1

Mixed Fertilizers

THE complexity of present manufacturing techniques and processes, the necessity of "pile" or "bin"

(*Continued on Page* 129)

IS YOUR AEROSOL FORMULATION

HIGHLY EFFECTIVE

against . . .

ROACHES AND FLIES

and SAFE TO USE in the KITCHEN

"NEW IMPROVED"

SULFOXIDE

the SUPERIOR Synergist for

Pyrethrum is your ANSWER

REMEMBER—
NO NASAL IRRITATION
WITH NEW IMPROVED
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735 West Division Street
Chicago 10, Illinois

INDUSTRY News

West Coast Show Cancelled

Cancellation of its Western States Garden Supply Trade Show originally scheduled for Oakland, California on September 13-14-15, 1955, has been announced by the sponsor, Garden Supply Merchandiser, Inc., Baltimore. Officials of the organization said that lack of interest in the show at this time made the action advisable.

The cancellation does not affect the National Garden Supply Trade Shows to be held in Chicago next January 24-25-26 or in New York City next February 7-8-9.

•

Amer. Ag. Names Humboldt

The American Agricultural Chemical Co., New York, announced recently the appointment of George S. Linton as manager of its new Humboldt, Iowa, branch and the appointment of Ronald R. Johnson as sales supervisor. Mr. Linton has been associated with AACC for the past 18 years, having been assistant manager of the company's Buffalo office at the time of his new appointment.

•

Atkins, Kroll Opens N.Y. Office

Atkins, Kroll & Co., 50-year old San Francisco firm with branches at Los Angeles, Guam, Manila and Cebu has announced the opening of a New York office. Manager is Edward Tolin, formerly in charge of the firm's Los Angeles office. He will market the agricultural chemicals, fertilizers and pesticides produced by Badische Analin & Soda Fabrik, A. G. Ludwigshafen, West Germany. Atkins, Kroll & Co. for some time the Western distributors for these products under "Horse & Lion" brand now will be exclusive distributors for them throughout the United States.

•

Formulators To Meet Oct. 3-5

The annual meeting of the Carolinas-Virginia Pesticide Formulators Association will be held October 3-5, 1955 at the Holly Inn, Pinehurst, North Carolina. Members and guests planning to attend are urged to make their reservations as soon as possible.

Spencer Advances Weller

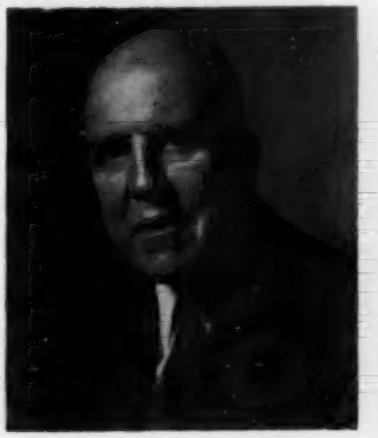
Paul L. Weller, manager of market research for Spencer Chemical Co., Kansas City, was recently named assistant to Jos. E. Culpepper, vice-president in charge of sales. Mr. Weller has served as market research head since November, 1953, when he went with Spencer. Previous to that time he was for three years district sales manager of the Wyandotte Chemicals Corp., in Cincinnati, Ohio.

FMC Advances Stoddard, Dade

Food Machinery and Chemical Corp., New York announced early in August that Russell B. Stoddard, manager of the company's Fairfield Chemical Division, has been assigned to the technical staff of FMC's chemical divisions administrative offices, New York City. Robert H. F. Dade, southeastern manager of FMC's Niagara Chemical Division has been named to succeed Stoddard as manager of Fairfield.

Mr. Stoddard is a national authority in the field of pyrethrum chemicals and other basic organic materials used in the production of pesticides. Formerly connected with the U. S. Industrial Chemicals Company Division of National Distillers Products Corporation, he was appointed acting manager of the Baltimore, Maryland operation when it was acquired by FMC last year and established as the Fairfield Chemical Division of the parent corporation. Ac-

R. H. F. Dade



R. B. Stoddard

cording to Ernest Hart, FMC executive vice president in charge of chemical divisions, Stoddard is being assigned to FMC's New York administrative offices where he will serve on the staff of Dr. Carl F. Prutton, vice president of the corporation and technical director of chemical divisions.

Mr. Dade is a native of Lake County, Florida. Following service with the Bureau of Entomology of the U. S. Department of Agriculture in the early twenties, he was one of the founders in 1923 of the Peninsular Chemical Company at Orlando, Florida. Peninsular, an insecticide producer and distributor for Niagara Sprayer and Chemical Company (now the Niagara Chemical Division of FMC) was acquired by Niagara in 1929. Mr. Dade has managed the Niagara Chemical Divisions operations in the southeast for the past twenty-six years. Commenting on Dade's new appointment, Jackson V. Vernon, president of FMC's Niagara Chemical Division, stated that his long experience in the production and marketing of agricultural chemicals excellently qualifies him for his new position as manager of Fairfield Chemical Division.

•

Grace Joins in SA Venture

W. R. Grace & Co., New York, together with Farbwerke Hoechst A. G. of Germany, is financing a joint Brazilian affiliate tentatively named FONGRA Productos Quimicas S. A., to construct a plant at Suzano, Sao Paulo, for the production of DDT, caustic soda, chlorine, sulfuric acid, hydrochloric acid, synthetic detergents and other products. Construction of the plant is scheduled to begin next year.

•

Kansas Lowers Ag. Chem. Fees

Action to decrease inspection fees on pesticides sold in Kansas was taken by the state board of agriculture during its quarterly session last month. Fees will be reduced after Jan. 1, 1956 from $15 to $10 per brand for the first ten brands sold by a firm. Where a firm sells in excess of ten brands, the additional brands will continue to be registered at $15 each.

Investigate Nicotine Imports

The U. S. Tariff Commission has been asked to investigate imports of nicotine to see if domestic producers are being competitively injured. The request is the latest in a series of anti-dumping cases that the U. S. Treasury has been conducting.

It is reported that a single Dutch exporter is shipping nicotine into the U. S. market at prices which are considered as less than fair value, as determined by law. Government records indicate that none of the insecticide was imported in 1954, that only 6,500 pounds came in 1953. No figures are available for 1955.

Records show that this country's principal producer, Virginia Carolina Chemical Co., exported more than 200,000 pounds of nicotine in 1954.

•

Hale Dies, Pioneer in Chemurgy

Dr. William J. Hale, 79, Dow Chemical Co. research consultant died August 8th after a brief illness. Dr. Hale was among the founders of "chemurgy," and coined the term to describe farm chemistry.

•

Pitts. Coke Names Swink

Pittsburgh Coke & Chemical Co., Pittsburgh, announced recently the appointment of Hugh Swink as field sales manager of the company's Agricultural Chemicals Division. Mr. Swink will continue as manager of the division's Dallas office, in charge of agricultural chemicals sales in the Southern cotton belt area.

•

Kies Heads Chem. Enterprises

William S. Kies, Jr., was named president of Chemical Enterprises, Inc., New York, early in August. He succeeds Dan Currl, Jr., who resigned recently. Mr. Kies is also chairman of the executive committee of the board of directors.

Chemical Enterprises, Inc., reports its New York office is now located at 60 E. 42nd St.

•

New Calif. Fertilizer Plant

Appointment of W. L. Dixon Jr., as general manager of the Western States Chemical Corp., Nichols, Calif., was announced late in August.

Mr. Dixon will head a new Western States fertilizer plant, now under construction at Nichols, Calif. The plant will have a capacity of 200 tons a day of pelleted complete fertilizers, when it begins operations early in 1956. E. W. Rowbotham will serve as plant manager.

•

US Steel NH_3 Plant

Construction on an anhydrous ammonia plant for the U. S. Steel's Columbia-Geneva Steel Division is scheduled to get underway later this year at the Geneva Works near Provo, Utah. The plant will use raw coke oven gas as the source of hydrogen for ammonia synthesis.

•

Open Canadian Office

Olin Mathieson Chemical Corp., Baltimore, have established a Canadian branch office of their industrial chemicals division, in Montreal, Canada. Keith S. MacLeod is the branch sales representative.

•

Oldbury Appoints Execs.

Oldbury Electro-Chemical Co., New York announced last month appointments to executive posts in sales and technical departments. Robert B. Boyd was named sales manager, Fred H. Berggren was named assistant sales manager, and J. Howard Brown, was named assistant technical director.

•

Veteran Bemis Exec. Dies

Henry H. Allen, retired vice president and director of Bemis Bro. Bag Co., died August 13 at his summer home near Huntington, N. Y., after an extended illness. He was 82 years old. Mr. Allen had completed 64 years of Bemis service at the time of his retirement in 1953.

•

Fall Fertilization Review

A discussion on the application of fertilizers in the fall, its limitations, advantages and disadvantages, etc. are contained in a booklet issued by Spencer Chemical Co., Kansas City. The booklet also includes several maps of the United States showing areas in which fall application of fertilizers offers definite advantages.

Cyanamid Drops Acrylon

American Cyanamid Company's Agricultural Chemicals Division announced last month that it is discontinuing manufacture and marketing of "Acrylon" Fumigant. The company has advised its customers that they can obtain the same fumigant, under the trade-name "Acritet 34-66," from Stauffer Chemical Co. Stauffer is producing the fumigant under a patent license agreement with Cyanamid.

Composition of the fumigant is 34% acrylonitrile and 66% carbon tetrachloride by volume. This mixture has proved its effectiveness in controlling infestations either by space, atmosphere chamber or vacuum chamber fumigation of stored tobacco and other products.

•

Chafer Quarantine Proposed

A quarantine to prevent spread of the European Chafer was proposed for Connecticut, New York and West Virginia, following a recent public hearing at Pittsburgh. The European chafer, heretofore not widely prevalent in the United States, is injurious to pastures, lawns and certain cultivated crops. The quarantine limits shipment to points outside the quarantined states of any materials that might harbor the chafer.

•

Mathieson Consumer Campaign

Reporting very satisfactory results with its use of outdoor posters, the agricultural chemical division of Olin Mathieson Chemical Corp., announced that the 1955 budget for outdoor advertising has been increased to six-times what it was in 1952.

The company first experimented with the outdoor medium in 1952, with posters in major farm centers and along rural highways. This year the campaign was increased to include displays in southern, southwestern and middle atlantic states. District managers have the responsibility for selecting the poster markets because of their knowledge of planting time tables for crops in their areas. Posters are used in each market at the time their sales appeals coincide with the farmer's need for the product. For example, AP (Ammo-Phos fertilizer) posters reach the Texas Gulf rice grower in January, the Oklahoma wheat grower in September.

Olin Mathieson reports that it is working out a plan whereby its 1956 space reservations will be made six months in advance.

•

Froot Heads MGK NY Office

As part of its expansion program McLaughlin Gormley King Co., Minneapolis, announced the opening of an eastern office located at 21 East 40th Street, New York City.

Nathan D. Froot who has been with Pesticide Advisory Service and Propel Chemicals for several years has been appointed manager of the newly created branch.

The New York office will have supervision of sales in the New England, New York and Middle Atlantic areas. Harry W. Gaffney will continue to represent the company in Philadelphia and Baltimore.

•

New Fertilizer Plant in Canada

A $23 million fertilizer plant for Northwest Nitro-Chemicals Ltd., is under construction at Medicine Hat, Alta., Canada. The new plant will include an anhydrous ammonia unit with a designed annual capacity of 33,000 tons; a nitric acid unit with capacity of 39,600 tons; and sulfuric acid unit with capacity of 132,000 tons.

The two principal sponsors of the project are Commercial Solvents Corp., New York and the New British Dominion Oil Co., Calgary, Alta.

•

Vulcan Adds Production Line

Vulcan Steel Container Co., Birmingham have just completed the installation of an additional steel pail production line.

This new line, which includes modern new paint and lacquer spray equipment and large modern baking ovens, increases the company's production capacity of pails and drums by over 60%. This new equipment also increases the company's capacity for producing pails with Hi-bake interiors. Another production line is proposed for manufacturing larger sizes of steel shipping containers.

Shell Reduces Price on D-D

The distributor price of D-D, a soil fumigant used against nematodes, is reduced from $1.20 to $1.00 per gallon, effective immediately, F. W. Hatch, manager of the agricultural chemicals division of the Shell Chemical Corporation, announced early in August. He said the decrease in price was made possible by an increase in production of D-D from Shell's new Norco, La., plant. The price reduction applies to D-D sold in 55 gallon drums when delivered by the carload or the full truck load.

He also said the company later this year would introduce a new 30 gallon container. In carload and full truck loads the D-D will be sold for $1.05 a gallon in this container.

•

Phytopaths to Meet Dec. 28

The American Phytopathological Society announced recently that its 47th annual meeting with the Southern Division, APS, and the A.A.A.S. will be held Dec. 28-30 at the Atlanta Biltmore Hotel, Atlanta, Ga. Program details will be announced later. Abstracts of papers proposed for the conference may be submitted to the secretary until Sept. 15.

•

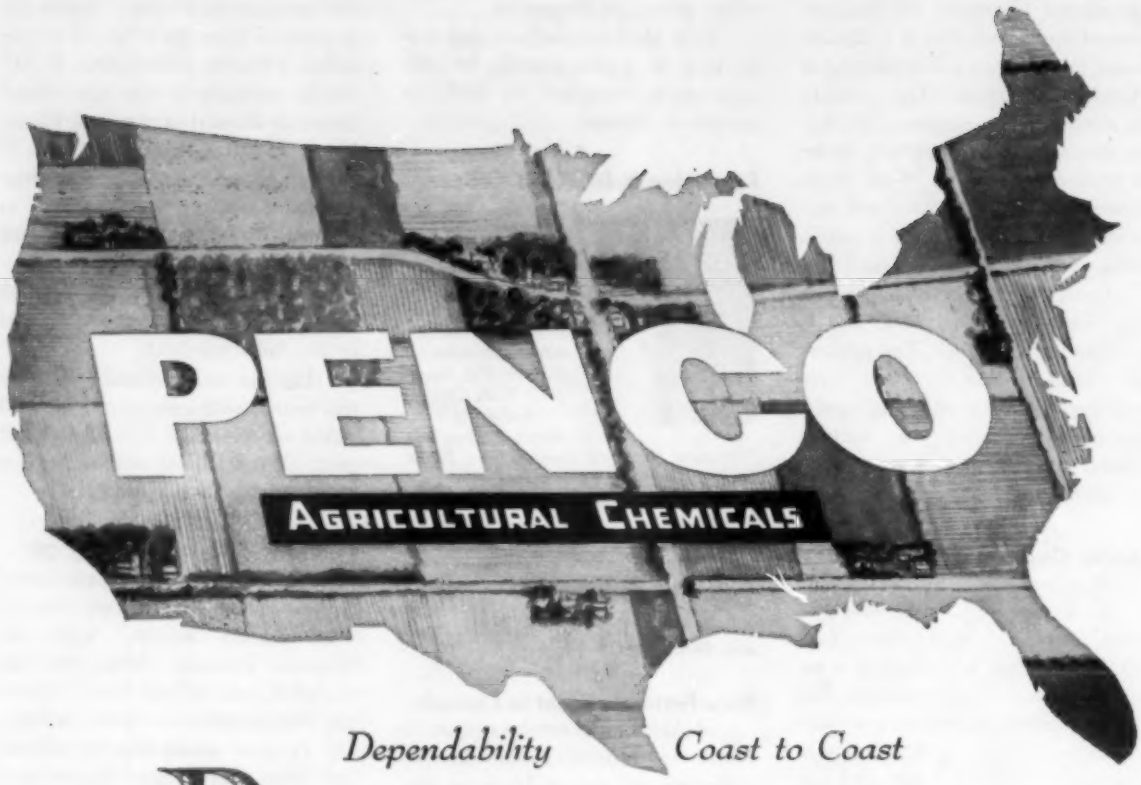
FMC Sales up in '55

Food Machinery & Chemical Corp., New York, reported record sales and earnings for both the second quarter and the first six months of 1955. Gross revenues in the second quarter were $75,809,628, compared with $65,562,927 last year, and six months gross totalled $137,694,943 against $116,517,852 in the first half of 1954.

•

Fertilizer Production in Israel

Plants for the production of phosphoric acid and potassium sulphate have started operations as part of the $15,000,000 Fertilizers & Chemicals, Ltd., installations in Israel. The phosphoric acid plant has an annual production capacity of 7,500 tons. The potassium sulphate unit has an annual capacity of 14,000 tons of which a major portion is earmarked for export.



Dependability Coast to Coast

PENCO sprays help protect the fruit crops and the forests of the great Northwest. In Maine and Idaho, better potatoes grow with the aid of Penco potato insecticides. From California to the Carolinas, cotton quality is improved by use of Penco cotton insecticides and defoliants. In the Middle West, Penco herbicides help produce weed-free crops, and livestock producers depend on Penco dips and sprays. In short, you'll find Penco products practically everywhere.

PENNSYLVANIA SALT MANUFACTURING COMPANY OF WASHINGTON
TACOMA 1, WASH.

Pennsalt Chemicals

Aurora, Ill.; Philadelphia, Penn.; Berkeley, Los Angeles, Calif.; Montgomery, Ala.; Bryan, Texas; Portland, Ore.; Yakima, Wenatchee, Washington

Monsanto, Lion Merge

The boards of directors of Monsanto Chemical Co. and Lion Oil Co. last month signed an agreement of merger of Lion with and into Monsanto. The agreement will be submitted for approval to stockholders of the two companies at meetings called for September 23. If approved, the merger will be effective September 30.

In a joint announcement, Monsanto's president Charles Allen Thomas and Lion's board chairman T. H. Barton of El Dorado, Ark., stated that the basis of merger if approved by the stockholders will be the issuance of 1½ shares of Monsanto $2 par value common stock for each outstanding share of Lion stock.

•

Diamond SE District Office

The Memphis branch sales office of Diamond Alkali Ci. will be known henceforth as the Southeastern District Office. In making the announcement, Diamond said the newly-designated name has been adopted because it is more fully in keeping with the increased territorial coverage presently handled by the Memphis-located organization.

•

Spencer Organization Change

Spencer Chemical Co., Kansas City, Co., announced two major shifts in the Spencer organization early in August. In the first move, Richard F. Brown, general works manager, was named vice president and general works manager. In the second move, the research and development activities of the company were established as a separate division. Dr. John R. Brown, Jr., general manager of research and development, was named managing director of the new division. Although they bear the same name, these gentlemen are not related.

•

Pennsalt Names Brown a Mgr.

Pennsylvania Salt Manufacturing Co.'s I. P. Thomas Division has announced the appointment of George Brown as manager of the Paulsboro (N. J.) plant. This unit produces commercial fertilizers, phosphoric and sulfuric acids, and water conditioning chemicals.

Mr. Brown was formerly assigned to Pennsalt's Industrial Chemicals Division as assistant to the manager of manufacturing. He joined the company in 1953 following a six year association with the American Viscose Corporation.

•

New Velsicol Foreign Co.

Velsicol Corp., Chicago, announces the formation of a separate company to handle its expanding foreign trade activities. The new company will be known as Velsicol International Corp., C. A. The main office is to be located in Chicago while a branch office is to be located in New York City.

The new organization will be headed by E. T. Collinsworth, Jr., who has been named president. Collinsworth still retains his post as vice-president and general manager of the parent company.

•

Gilman Advances Munger

In realigning sales and executive personnel, Gilman Paper Co., New York, announced that F. L. Munger, formerly asst. to the vp in charge of sales, has been promoted to vice-president and sales manager of the Kraft Bag Corp., Gilman's bag manufacturing subsidiary, with fully integrated plants at St. Marys, Georgia and Gilman, Vermont. Prior to joining Gilman in 1953 as western sales manager in charge of the company's Chicago office, Mr. Munger had been with Bemis Bros. Bag Co., and earlier with St. Regis Paper Co.

•

Charge Patent Infringement

Inglett & Corley, Inc. of Augusta, Ga., manufacturer of bagging and batching equipment, filed an action on June 23, 1955 in the United States District Court for the Southern District of Florida, Miami Division, against Everglades Fertilizer Co., Inc., of Ft. Lauderdale, Florida, for infringement of Patent No. 2,705,607 covering a bagging method. The complaint, which was served on June 24, alleges that Everglades in infringing the said patent is using an Open Mouth Filling Machine manufactured by Hudson Machine Comany of Montgomery, Alabama, and sold by Kraft Bag Corp. of New York.

Shell Announces Exec. Changes

Five staff changes in Shell Chemical Corp., N. Y., were announced early in August by W. F. Hatch, manager of the agricultural chemicals division, New York. The changes were made because of the rapid expansion of business and the need for a better distribution of administrative responsibilities.

L. G. Smith, who has been assistant to the sales manager, has been appointed manager of a newly-created distribution-operations department.

W. E. McCauley, head of product and sales development department, was named assistant to the sales manager.

C. C. Compton was named manager of the sales development department—formerly known as the product and sales development department.

H. H. Dodge, senior district representative for the St. Louis district, was named supervisor for the sales development department in the Midwest area. He will continue to operate from the St. Louis district office.

J. F. White will be district manager for the newly-created Delta-Houston area. District headquarters will remain at Jackson, Mississippi.

•

ASFFCO Names Committees

Dr. M. P. Etheredge, dean of science and state chemist, State College, Mississippi, who was recently elected president of the Association of Southern Feed and Fertilizer Control Officials, announces the following committee appointments to serve the association for 1955-56:

Feed Committee: Bruce Poundstone, Kentucky, ex-officio chairman; E. A. Epps, Louisiana; Harold Homan, Florida; W. J. Huffman, Mississippi.

Fertilizer Committee: Bruce Cloaninger, South Carolina, chairman; Dr. J. F. Fudge, Texas, L. C. Jacobs, Tennessee.

Pesticide Committee: Rodney Berry, Virginia, chairman; Clyde Bower, Oklahoma; Dr. Henry DeSalvo, Arkansas.

Constitution & By-Laws Committee: Dr. Ernest Constable, North Carolina, chairman; Miss Frances Bonner, Louisiana; Dr. Willis Richerson, Oklahoma.

Editorial Committee: F. D. Brock, Texas, chairman; James C. Oswald, Georgia; John Reitzel, North Carolina.

Nominating Committee: Parks Yeats, Oklahoma, chairman; George Marsh, Alabama; and Joe Taylor, Florida.

HERE'S HOW 7 Great KILL Promotions Helped You Profit More With HEPTACHLOR

KILL COTTON INSECTS

3,421,804 sales messages in farm magazines, newspapers, and over the radio—plus window banners, folders, and mobile displays...all told the cotton grower about Heptachlor, and its effectiveness against boll weevils and other cotton insects. This hard-hitting selling is still expanding making Heptachlor a *fast-mover* for dealers.

KILL CORN ROOTWORMS

More than 206,000,000 sales messages were beamed to Midwest farmers to tell the story that HEPTACHLOR KILLS CORN ROOTWORMS. Leading farm publications, radio stations and newspapers were used in the campaign. Wall charts, counter cards, and folders were used in the campaign to tie dealers directly into the selling effort. When the dust cleared, Heptachlor had moved into top position as the *leading soil insecticide.*

KILL ALFALFA WEEVILS

Alfalfa growers in the Northwest and Eastern states knocked out weevils with Heptachlor, as dealers cashed in on farm paper and newspaper ads. Editorials, wall posters, banners, mailers and folders combined with advertising to carry more than 970,000 sales stories to Western alfalfa states.
More than 949,000 sales messages were poured into Eastern alfalfa states through magazines and newspapers.

KILL GRASSHOPPERS

24,136,000 sales messages blanket the areas where hoppers are a major pest to repeat the story over and over—HEPTACHLOR KILLS GRASSHOPPERS. Campaign was carried through leading farm papers and radio stations with plenty of merchandising aids to cinch sales for dealers.

KILL POTATO WIREWORMS

More than a half-million Heptachlor messages in magazines and local newspapers told the story to potato growers about Heptachlor effectiveness against wireworms and other potato insects. Farmers produced high quality spuds and dealers made profits.

KILL ONION THRIPS

In Texas, California and Oregon, Heptachlor *effectiveness* is the theme for magazine, newspaper, radio and direct mail activities ...more than 872,000 messages! Dealers found that Heptachlor moved fast when growers got the low-down on Heptachlor for meeting the thrip menace.

KILL SOIL INSECTS IN FLORIDA

Heptachlor's effectiveness against wireworms and other soil insect damage to potatoes and sweet corn—that was the story told to Florida growers through newspapers, magazines and radio stations. 650,000 selling messages did the job as dealers profited from fast-moving *Heptachlor.*

In addition to the major programs outlined above, Heptachlor was widely promoted for many local applications. These thousands of additional sales messages were another important source of dealer profits from Heptachlor.

BUT THAT'S NOT ALL—MERCHANDISING AND PROMOTION BEHIND HEPTACHLOR IS BEING STEPPED UP FOR 1956 TO HELP YOU MAKE RECORD SALES AGAIN IN THE COMING SEASON. MAKE YOUR PLANS NOW TO CASH IN ON THIS EXPANDED PROGRAM.

REMEMBER, YOU'LL PROFIT MORE WITH HEPTACHLOR

VELSICOL CHEMICAL CORPORATION

PETROLEUM DERIVED CHEMICALS — VELSICOL — SERVING BASIC INDUSTRIES

REPRESENTATIVES IN PRINCIPAL CITIES
General Offices and Laboratories, 330 East Grand Avenue, Chicago 11, Illinois

Dorough Supt. of New Calspray Plant in Richmond

California Spray-Chemical Corp. officials look over the plans for the initial dredging and fill operations at Calspray's new $16,000,000 fertilizer plant site in Richmond, California. From left to right are: L. R. Gardner, vice-president and manager, research and development; E. W. Cannon, vice-president and manager, marketing; A. W. Mohr, president; C. E. Cody, regional manager, west marketing; Leslie Hamilton, coordinator of fertilizer operations; P. S. Williams, vice-president and chief engineer; and Calvin Dorough, superintendent, fertilizer, manufacturing. The four new Calspray fertilizer plants in the $16,000,000, six plant fertilizer project of Standard Oil of California and its subsidiary, Calspray, will be producing fertilizer for the Western farmer by early summer, 1956.
A pelleted complex fertilizer plant and the ammonium nitrate solution plant will be built by the Chemical and Industrial Corporation of Cincinnati, Ohio. They are the representatives of the French PEC (Potasse et Engrais Chimiques) fertilizer process and will build the first PEC fertilizer plant to be built outside of Europe for Calspray.
Using raw material from the west, the new plants will produce ammonium nitrate solutions, ammonium sulphate, anhydrous ammonia, aqueous ammonia, and high analysis pelleted fertilizers.

Aerial DDT Spray Project

Prevention of damage by the budworm to western timberlands valued at $750 million was undertaken by the U. S. Forest Service last month in a DDT aerial spraying project contracted by the department. Two and a quarter million acres of spruce-fir trees located in Oregon, Idaho, Montana and New Mexico were sprayed with a mixture of DDT and fuel oil.

Some 12.3 billion board feet of timber, valued at $38 million as it stands, were threatened immediately. The cost of spraying averages about one dollar per acre.

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To Form Entomology Club

The committee for the establishment of an Entomology Club for New Jersey has made tentative plans to hold an organizational meeting this fall and has sent invitations to prospective members. A constitution which will be submitted to the group at the meeting is being drafted.

The projected program for the fall meeting includes presentation of papers on the various phases of entomology: research, regulations, teaching and extension. C. C. Alexander is chairman of the group, assisted by E. G. Rex and Walter Fleming, all of Rutgers University and the New Jersey Agricultural Experiment Station.

•

Burnett Mgr at J-Manville

The appointment of Clinton B. Burnett as general manager of the Johns-Manville Celite Division, was announced early in August. Mr. Burnett succeeds Arthur S. Elsenbast, a pioneer in the development of manufacturing methods and uses of diatomite products, who retired on July 31, 1955.

Mr. Burnett, who continues as vice president of Johns-Manville Products Corp. was director of engineering before his appointment as assistant general manager of the Johns-Manville Celite Division in July of 1954.

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U. S. Potash Expansion

The directors of the United States Potash Co., New York, have approved the expenditure of approximately $3,000,000 to increase the output of its mine near Carlsbad, New Mexico and to expand its refining facilities, to provide about 20% additional productive capacity. It is expected that under this expansion program the additional production will be available for the 1956-1957 sales year which begins June 1, 1956.

The United States Potash Company has also announced that it has secured the reservation of a large tract of Crown lands in the Province of Saskatchewan, Canada for the purpose of exploring for potash. A limited acre-drilling program has been approved.

•

New Dallas Storage Plant

The opening of Texas Solvents and Chemicals Co. plant in Dallas was announced recently. Among the products available are plasticizers, waxes, weed killers and naval stores. W. R. Walker is in charge of the plant.

•

Fertilizer Safety Meeting

A fertilizer section safety meeting will be held at the annual South Carolina Accident Prevention Conference November 4, in Charleston, S. C., with Alton L. Foster, International Minerals & Chemical Corp., Spartanburg, presiding. Reports to be made at the conference include "Acidulation Hazards," E. U. Campbell, Anderson Fertilizer Co., Anderson, S. C.; "Report on Activities of Safety Organizations," V. S. Gornto, Smith-Douglass Co., Norfolk, Va.; "Safety Organization in a Small Plant," J. P. Huckaby, Southern Fertilizer & Chemical Co., Roebuck, S. C.; and "Material Handling Hazards," Percy L. Steel, F. S. Royster Guano Co., Charleston, S. C.

•

NY Garden Show, Feb. 7-9

Plans for instructive marketing panels and clinics, model service and repair shops and a "short course" in how to prepare advertising and promotional material will be combined with more than 500 exhibits of new gardening merchandise at the 15th National Garden Supply Trade Show at Kingsbridge Armory in New York City next February 7, 8 and 9. The theme of the show is "what to buy—how to sell it." A highlight of the program is a dealer dinner to be attended by visiting garden supply dealers and their guests.

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Monsanto to Sell Farmer

Monsanto Chemical Co., St. Louis announced last month that its organic chemicals division will market agricultural chemical formulations under the Monsanto label in a 15-state midwestern area beginning in 1956. The company is starting immediately to set up the necessary wholesale and retail distribution to the area for its new line of brandname farm chemicals. To date, 18 products have been named to the line which includes weed-killer formulations, brush-killers, insecticides and crop desiccants.

The initial sales region for Monsanto's farm chemicals includes: Colorado, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Ohio and Wisconsin. Four sales districts have been established to service the area with district headquarters to be located at Minneapolis, Minn., Des Moines, Iowa, Kansas City, Mo., and Indianapolis, Ind.

•

Potash Deliveries Up 8%

Potash deliveries in North America by the 7 leading U. S. potash producers and the importers made a new resord of 2,164,997 tons K_2O during the fiscal year of June 1954 through May 1955, according to the American Potash Institute. This represents an increase of 8% over 1953-1954. The deliveries were made in 46 states, the District of Columbia, Canada, Cuba, Hawaii, Puerto Rico, and a few other countries.

Potash for agricultural purposes in the Continental United States amounted to 1,897,404 tons K_2O, an increase of more than 6% over last year; Canada received 86,881 tons K_2O, an increase of 20%. Illinois was the leading state for deliveries, followed in order by Ohio, Indiana, Georgia, Virginia, and Florida. (Deliveries do not necessarily correspond to consumption in a given state.)

Muriate of potash was the principal grade, comprising 93% of the total agricultural potash delivered; sulphate of potash and sulphate of potash-magnesia together made up 7% of deliveries; while manure salts dropped to an insignificant figure, reflecting the trend toward the use of more concentrated materials.

Deliveries of potash for chemical uses amounted to 103,319 tons K_2O, an increase of 12% over 1953-54. The muriate grade made up 94% of chemical deliveries, and sulphate of potash 6% .

•

AAACE-NPFI Award Given

Mrs. Anna Jim Erickson, extension information specialist at Washington State College, was presented the AAACE-National Plant Food Institute Award at a special luncheon ceremony in the Fontenelle Hotel, July 26th.

Announcement of the award was made by William B. Ward, Cornell University, and president of the American Association of Agricultural College Editors. Mrs. Erickson was presented a $500 check and a scroll by Louis H. Wilson, secretary and director of information for the National Plant Food Institute, Washinton, D. C.

Purpose of the award is to provide an opportunity for the member of the association who has shown notable growth in competence and achievement in agricultural communications to receive advanced professional improvement training in some phase of agricultural information work.

Entomology Group to Canada

The tenth International Congress of Entomology will be held in Montreal, Canada Aug. 17 to 25, 1956. The meetings will be held at McGill University and the University of Montreal.

The provisional program lists fifteen sections of subject matter, including all phases of fundamental and applied entomology. In view of the rapid strides that the profession has made in recent years, as well as the fact that this is the first meeting of the Congress in North America since the late 1920's, it affords unusual interest to all entomologists in industry, government and private foundations.

Excursions in conjunction with the Congress are being arranged. A Registration Fee of $15.00 has been announced. Those wishing to have further information with a view to attending the Congress should write to the secretary: J. A. Sownes, Division of Entomology; Science Service Building; Ottawa, Ontario, Canada.

•

Vulcan Consolidates

A new organization, Vulcan Containers Inc., has been formed by consolidating Vulcan Stamping and Manufacturing Co., and Vulcan Tin Can Co. The new organization has its main plant and office at Bellwood, Ill.

Oklahoma City Firm Buys "Big Boy" Fertilizer Plant

A newly-formed Oklahoma City firm, the Nichols Fertilizer and Chemical Co., announced recently the purchase of the Oklahoma Fertilizer and Chemical Co., manufacturers of "Big Boy" and "Sunflower" fertilizers. The purchase price was reported in excess of $750,000. Sale was consummated during a signing ceremony in the office of real estate broker, Keats Soder, with Earl Nichols, president of Nichols Fertilizer and Chemical Co., and Lester E. Cox, head of Oklahoma Fertilizer and Chemical Co., as the principals. (Photo: W. Frederick Nichols, secretary-treasurer of the new firm; Earl Nichols; Lester E. Cox; Mr. Soder).

Earl and William Nichols are associated with the Nichols Seed Co., Oklahoma City, which handles seeds, insecticides, fertilizer, and farm supplies.

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including

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New Diamond Black Leaf Hdg.

Headquarters staff of Diamond Black Leaf Co., manufacturers of pest-control products, was transferred in August from Richmond, Va., to newly-established and expanded offices in the Union Commerce Building at Cleveland, Ohio.

Product development and research activities of the firm will continue to be conducted at Richmond, where the company maintains a district sales office and operates one of its four formulating plants. Other Diamond Black Leaf production facilities are located at Louisville, Kentucky; Montgomery, Alabama, and Waco, Texas.

•

Woods Addresses Agronomists

The American farmer is increasing his use of plant foods by 10 per cent each year, J. Albert Woods, president of Commercial Solvents Corporation, reported, July 27, to the American Society of Agronomy, Northeastern Branch, at the 75th anniversary celebration of the Jordan Soil Fertility Plots at Pennsylvania State University.

Not only is the use of mixed fertilizers on the upswing, Mr. Woods said but among the three basic plant foods, nitrogen leads in use.

Mr. Woods urged the fertilizer industry to seek new plant food markets and supply the specific types of plant food needed at home and abroad.

"The American farmer uses about two thirds of our total fertilizer production in mixed forms, as rightly he should. But we must recognize the types of formulations of plant foods required by farmers in the three major farming groups throughout the world —and then proceed to meet the need."

•

Shrimp for Residue Test

A tiny, insecticide-sensitive crustacean — the brine shrimp — holds promise of providing an excellent test for the presence of insecticide residues, the U. S. Department of Agriculture reports.

Insect pathologists of the Department's Agricultural Research Center, Beltsville, Md., have found that brine shrimp react to extremely small amounts of several insecticides, even when the toxicants are greatly diluted in either fresh or salt water. Further, the shrimp make an ideal laboratory tool, being easy to maintain and use. (Brine shrimp for laboratory use are about 1/8 inch in length).

•

Emulsol Names Pacific Rep.

The Witco Chemical Co., with offices in Los Angeles and San Francisco was named to serve as technical sales representatives for Emulsol Chemical Corp., Chicago, in the California area for its surfactants used in the industrial cleaning, sanitizing, petroleum, and sanitation specialties field. The W. G. Wunderly Co., Pasadena, Calif., and F. M. Speekman Co., San Francisco will provide the Emulsol technical sales and service in southern and northern California, respectively in the agrichemical, food, cosmetic, and mining industries.

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Farmers well know that corn, like most crops, takes great quantities of nitrogen from the soil. Anhydrous ammonia acts as a fountain of youth. It gives the soil plenty of nitrogen for high crop yields at minimum cost per acre. In addition, anhydrous ammonia is used in the manufacture of many dry fertilizers.

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In the West: *L. H. Butcher Co.*

In Canada: *Naugatuck Chemicals Division of Dominion Rubber Company, Ltd.*

In Europe: *Atlantic Chemicals SAB, Antwerp, Belgium*

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Colo. Ag. Dept. Sued

A $40,000 court suit was on file late in July against the Colorado Department of Agriculture, charging "failure to provide the necessary acreage" to fulfill its grasshopper spraying contract with an Oregon flying service.

The Ace Flying Service, Inc., charged that the Department agreed last year to pay 13 3/4c an acre for spraying one and one-half million acres of rangeland which were infested with grasshoppers. However, according to the petition, the firm was allowed to spray only 240,000 acres and the state still owes $40,000 on its contract.

L. J. Demers, president of the flying service, indicated that the Colorado legislature appropriated $200,000 for grasshopper control throughout the state, and that most of this amount was not used.

•

Lewis Heads Sprayer Assoc.

Leading manufacturers of hand sprayers and dusters joined in celebrating the 10th anniversary of National Sprayer & Duster Association in the annual meeting held at Montreal, Canada, July 21-22, 1955. D. P. Lewis, H. D. Hudson Mfg. Co., Chicago, Ill., was elected president. P. L. Hauser, Root-Lowell Mfg. Co., Chicago, retired as president and was elected as treasurer to succeed Mr. Lewis. E. M. Myers, F. E. Myers & Bro. Co., Ashland, Ohio, was re-elected vice president. Other members elected to the executive board were R. B. Chapin, R. E. Chapin Mfg. Works, Inc., Batavia, N. Y; R. M. Yoder, Dobbins Division, Chamberlain Corp., Waterloo, Iowa; R. W. Merritt, Root-Lowell Corp., Chicago, and T. M. Burton, D. B. Smith & Co., Inc., Utica, New York.

Member company representatives in the meeting carefully assessed the potential demand for modern spraying and dusting equipment and agreed that the continued increase in population with a substantial increase in the number of separate households provides a growing market for equipment to apply insecticides and weedicides. The potential outlet for merchandising equipment for farm use was emphasized too, since, according to USDA, only about one-sixth of our cropland is being sprayed and dusted regularly. New methods of applying plant foods, new controls for rodents and insects in stored grain, new soil treatments, etc., offer wider uses for modern equipment.

Plans were completed for reproducing the Sprayer & Duster Manual.

•

Antibiotics in Agriculture

The use of antibiotics in agriculture wil be discussed at an international conference to be held Oct. 19-21 in Washington under the sponsorship of the National Academy of Sciences-National Research Council in co-operation with the Agricultural Research Institute. Invitations to participate in the conference have been extended to 44 leading research scientists from 13 countries.

First proposed to the NAS-NRC by Chas. Pfizer & Co., Inc., the conference was then opened to the antibiotics industry and will also be supported by the American Cyanamid Co., Merck & Co. and E. R. Squibb & Sons.

DuPont Men in S. America

The Du Pont Co. of Wilmington, recently added a new agricultural service and development specialist for Brazil, Uruguay and Argentina, and extended the territory of another specialist to include Central America. The company assigned its first agriculturist abroad to Latin America in 1952.

The newly assigned man is Verne F. Bliss, who will be based in Montevideo, and will cover Brazil, Uruguay and Argentina. Dr. Milton E. Gertsch, now based in Havana to cover the West Indies, is extending his territory to cover Central America. William R. Irey, working out of Bogota, Colombia, is covering Colombia, Ecuador, and Venezuela. Each of the three men is assigned to provide technical assistance in the use of Du Pont agricultural chemicals.

•

Feed Fert. Officials to Meet

The Association of Southern Feed and Fertilizer Control Officials will hold its fourteenth annual convention June 28-30, 1956 at the Hotel Roanoke, Roanoke, Va.

M. P. Etheredge, president, and Bruce Poundstone, secretary-treasurer, advise members to write early for reservations.

Fulton Bag Dedicates $16 Million Plant in New Orleans

Dedication of Fulton Bag & Cotton Mills' new million dollar plant took place on July 11th in New Orleans. Ceremonies were held on the front steps leading to the general offices of the new building. The dedication climaxed almost two-years of construction and moving of various units from old quarters in two separate buildings to the single unit new plant. The plant which is located at 1400 Annunciation Street and within sight of the Mississippi River, was begun in October 1953. One year later, in October, 1954, it was ready for partial occupancy. Only within recent weeks have the complete manufacturing operations been underway in all departments for making cotton bags, burlap bags, multiwall paper bags, open mesh bags, waterproof paper lined bags, cotton pick sacks, tents,tarpaulins, curing mats, salvage covers and other products.

Dedication of Fulton Bag & Cotton Mills' new million dollar plant took place with Mayor de Lesseps S. Morrison (center) cutting ribbon; Norman E. Elsas, Atlanta, chairman of the board of directors (left) and Jason M. Elsas, executive vice-president and New Orleans branch manager (right) stand by.

Meeting Calendar

Sept. 5-9 — American Institute of Biological Sciences. Michigan State University, East Lansing, Mich.

Sept. 7-9—National Agricultural Chemicals Assoc., Annual meeting, Spring Lake, N. J.

Sept. 7-9 — Beltwide Cotton Mechanization Conf., Texas A&M College

September 11 - 16 — American Chemical Society, national meeting, University of Minnesota, Minneapolis, Minn.

Oct. 3-5 — Carolinas-Virginia Pesticide Formulators Association. Holly Inn, Pinehurst, N. C.

Oct. 11 — Western Agricultural Chemicals Association meeting, Claremont Hotel, Berkeley, Calif.

Oct. 13-14 — Association of American Fertilizer Control Officials. Shoreham Hotel, Washington, D. C.

Oct. 13-14 — Canadian Agricultural Chemicals Association, annual meeting, Sainte Adele, Quebec, Canada.

Oct. 16-20 — National Pest Control Association. Cosmopolitan Hotel, Denver, Colo.

Oct. 17-21 — National Safety Congress & Exposition. Chicago, Ill.

Oct. 18-20 — Entomological Society of Canada. Fredericton, B.C.

Oct. 27 — Middle West Soil Improvement Committee, annual business meeting. Sherman Hotel, Chicago.

Nov. 2-3—Pacific Northwest Plant Food Assn. Pilot Butte Inn, Bend, Oregon.

Nov. 3-4—Northeastern Division American Phytopathological Society, Springfield, Mass.

Nov. 4 — Fertilizer Section, South Carolina Annual Accident Prevention Conf., Hotel Francis Marion, Charleston, S. C.

Nov. 7-8—California Fertilizer Assoc., 32nd annual meeting, Hotel Mark Hopkins, San Francisco.

Nov. 8-10—New York State Insecticide Fungicide Meeting, Cornell University, Bibbins Hall, GLF Exchange, Ithaca, N.Y.

Nov. 17-18 — Nitrogen Solution Field Day, State Armory, Springfield, Ill.

Nov. 28 - Dec. 1 — Entomological Society of America, Annual Meeting, Netherlands Plaza, Cincinnati.

Dec. 5-7 — Chemical Specialties Manufacturers Assn. Roosevelt Hotel, New York City.

Dec. 5-9 — Exposition of Chemical Industries, Convention Hall, Philadelphia.

Dec. 5-7 — Agricultural Ammonia Institute, Kansas City, Mo.

Dec. 15-16—Beltwide Cotton Production Conference, Hotel Peabody, Memphis, Tenn.

Dec. 28-30 — American Phytopathological Society of America. Biltmore Hotel, Atlanta, Ga.

Jan. 4-6—Weed Society of America. Hotel New Yorker, New York City.

Jan. 10-11 — North Carolina Pesticide School, Raleigh, N. C.

Jan. 16-18 — N. W. Vegetable Insect Control Conf., Imperial Hotel, Portland, Ore.

Jan. 18-20 — Western Cooperative Spray Project, Imperial Hotel, Portland, Ore.

Jan. 24-26 — Midwestern Garden Supply Trade Show, International Exposition Hall, Chicago.

Feb. 7-9 — N. Y. Garden Supply Trade Show, Kingsbridge Armory, New York City.

Feb. 15-17—California Weed Control Conf., Sacramento & Davis, California.

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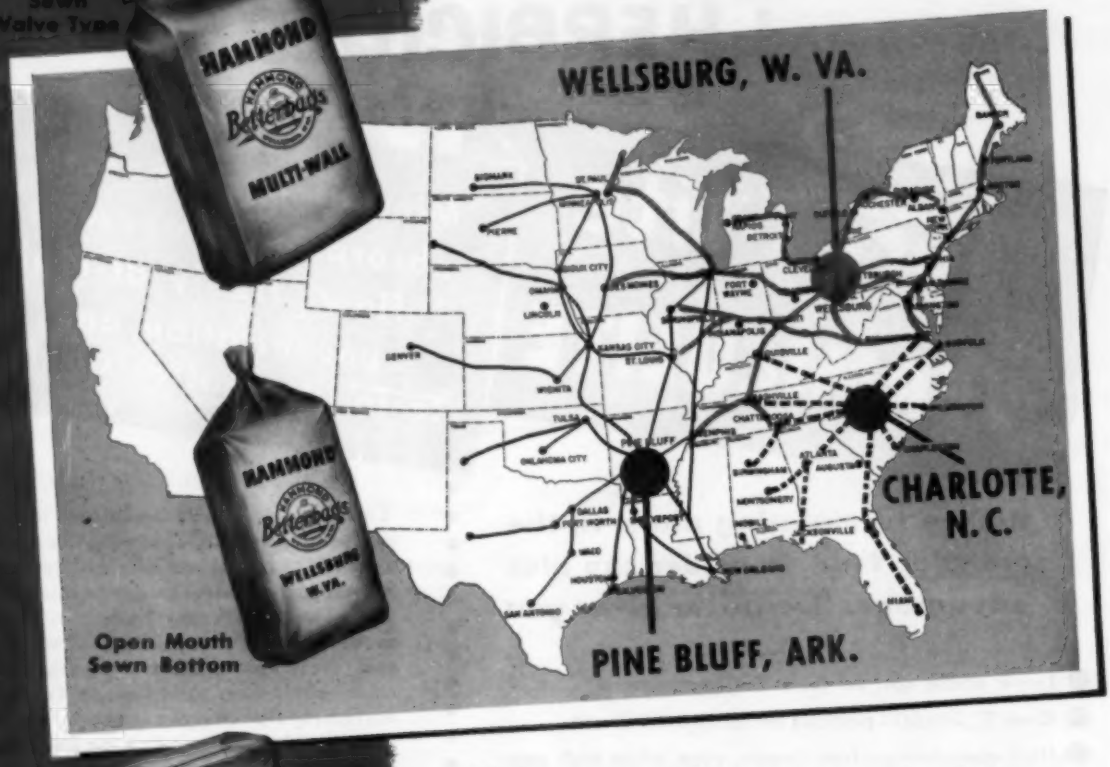

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Editors Award to Wilson

Louis H. Wilson, secretary and director of information for the National Plant Food Institute, Washington, D.C., was presented the Reuben Brigham Award by the American Association of Agricultural Editors "for meritorious service to agriculture" on July 27th at a banquet session of the Association, membership of which comprises the extension and experiment station editors of the Nation's land-grant colleges.

Louis H. Wilson

The award is given annually by AAACE to a non-member of the Association in the fields of agriculture or home economics, who has made outstanding contributions in the public relations and journalism professions.

"I am grateful to you for honoring our (the fertilizer) industry which has made my work with you possible," Mr. Wilson said in accepting the award. "And, I am particularly grateful for the recognition, the cooperation, the friendly working relationships that exist between industries that have farmers as their customers and the extension service and experiment stations. In helping our land-grant colleges to build a sound-management program, we are helping in building a sound program for business. Most industries with farmers as their customers realize that prosperity for the farmer means prosperity for the associated industries of agriculture. By joining hands with the extension and experiment station editors, agricultural industry has taken its first step forward in promoting a sound agricultural program and in building a self-sustaining agriculture."

•

McCord Mgr. of Bagpak

C. B. McCord has been named plant manager of International Paper Co.'s three multiwall bag plants. Mr. McCord succeeds S. D. Andrew who retired July 1, after 26 years of service. Mr. Andrew had been manager of all the Bagpak Division's plants since 1929. At the same time, T. A. McCord was named assistant plant manager of the plants which are located at Camden, Arkansas; Bastrop, Louisiana and Mobile, Alabama.

•

Two Florida Strikes Settled

Two Florida phosphate firms resumed production recently following wage settlements with the striking AF of L Chemical Workers Union. First to re-open were Coronet Phosphate Co., and American Agricultural Chemical Co. who signed contracts providing wage increase of from six cents to 33 cents per hour.

Workers were still striking in mid-August at plants belonging to International Minerals & Chemicals Corp., American Cyanamid Co., Virginia-Carolina Chemical Co. Armour Fertilizer Works, and F. S. Royster Guano Co.

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STAUFFER CHEMICALS

Davison To Mfg. Pringle Fert.

A. F. Pringle & Co., Charleston, S. C., fertilizer manufacturers, announced last month that an arrangement has been made with the Davison Chemical Co., Baltimore, to take over the manufacture of the Pringle firm's fertilizer. The Pringle Co. will discontinue manufacturing operations, Dec. 1st.

•

Southern Weed Conf. Jan. 16

The ninth annual Southern Weed Conference will be held January 16-18 at the Hotel Jung, New Orleans, La. Weed control in pastures, field crops, horticulture, and other phases of agriculture will be discussed by speakers representing the southern states. Dr. Mark Weed, E. I. du Pont de Nemours & Co., is the program committee chairman. Officers for the 1956 conference include: vice president W. B. Albert, South Carolina Agricultural Experiment Station, Clemson, S. C.; secretary-treasurer, E. G. Rodgers, Florida Agricultural Experiment Station, Gainesville; and president, Glenn C. Klingman, North Carolina State College, Raleigh, N. C.

PHYTOPATHS-OPI MEET

(*From Page 57*)

Purdue will serve as councilor.

The group voted to hold the 1956 meeting at Kansas State College, Manhattan, Kansas, during the early part of June. Minnesota will serve as host for the 1957 meeting.

Demonstrations of new spray equipment held outstanding interest for members of the Ohio Pesticide Institute. One of these was a combination rotovator and soil treatment device designed by Frank Irons and Donald Black of the USDA field laboratory at Toledo.

Spray nozzles were so arranged to direct the liquid on the soil directly ahead of the rotovator blades. It is expected that the machine will be useful in treating soil infested with nematodes and other organisms. Since the equipment is still in the experimental stage, Mr. Irons stated that no results could be given as yet from this year's tests.

Another piece of equipment also developed by the Toledo group was a low pressure-low gallonage spray for use with vegetables. Speed and accuracy of adjustment were two outstanding features as pointed out by Mr. Irons. The spray pressure can be adjusted from zero to 600 pounds, which, together with changes in the speed of the machine produces variation in droplet size.

Dr. J. D. Wilson of the Ohio Station's department of plant pathology said tests showed that a rate of 30-40 gallons of material per acre applied at 60 pounds pressure is giving good results.

Dr. Wilson also told Pesticide Institute visitors that he was testing weaker than normal mixtures of Bordeaux plus adhesives and surfactants to increase the fungicidal properties of sprays. Because of the low incidence of disease in some vegetable crops this year at the Ohio Station, he reported that it was impossible to correctly evaluate some of the sprays.

Two other pieces of equipment demonstrated at the meeting were a band seeding drill adapted for application of granular insecticides at time of seeding, and a crop duster for use in treating corn for borers and ear worms.

Dr. C. R. Weaver, forage crop specialist in the Station's department of entomology, stated that tests at Wooster showed good control of clover root weevil through use of granular material in the band seeding drill. Insecticide is placed in the fertilizer hopper and then is deposited in a narrow band underneath the seeds.

It was Dr. Weaver's opinion that granular insecticides place the practice of aerial applications on a par with ground applications. This type of material should eventually replace other types of aerial dusts, he said.

Populations of clover root borers were reduced from 85 to 90 percent by use of one-half or three-fourths pound of aldrin per acre, when applied in a granular carrier.

Dr. H. C. Young, associate chairman of the department of botany and plant pathology, Ohio Station, served as narrator of the first day's session. Dr. C. R. Neiswander, associate chairman of the entomology department, was in charge the second day.

On the last day of the meeting, the group had arranged to watch an experimental airplane apply sprays for potato blight at the Osborne State Farm near Sandusky. Unfavorable weather, however, prevented the demonstration.

The plane was equipped for a high output and narrow swath, making it possible to apply over 15 gallons per acre with a 30 ft. effective swath. Twenty-four large size diaphragm shut-off nozzles are being used with a fan-driven one inch centrifugal pump. Pressure is controlled with an adjustable automatic by-pass valve. In order to accommodate a 50 gallon tank in the plane, the pilot's seat was elevated above the normal position.

A project on the influence of spray variation on the quality of potato chipping was explained by Dr. J. D. Wilson. He said results from previous experiments showed no difference regardless of what spray was used. Variety used in the test was Russet Rural. A shift from DDT to Dithane brought an increase of 35 bushels per acre. Potato chip manufacturers usually prefer spuds of a high specific gravity since they absorb less cooking fat.

At the Celeryville Substation, tour members viewed experiments on celery disease control, onion maggot and thrips control and fungicide-insecticide formulations for potatoes. The Celeryville farm is located in the heart of the state's largest muck crops land. Station officials cited heavy interest among area growers in the research at the substation. Weed control recommendations for onions have been especially helpful. One of the most important remaining problems is the control of nematodes, A full scale project is now underway.

The meeting concluded with a dinner at Plumbrook country club near Sandusky.★★

AMA Cautions Chlordane Use

The Committee on Pesticides of the American Medical Association in an article in the August 15th issue of the *Journal of the American Medical Association* makes several suggestions in connection with potential hazards accompanying use of chlordane in agricultural and household insecticides. Chlordane poisoning, they warn, may be caused by repeated skin contact, breathing of the fumes, or accidentally swallowing the chemical. "Chlordane appears to be absorbed more rapidly than similar insecticides," they caution.

Chlordane should not be used on food crops with exposed edible parts, or on crops fed to animals, because it can be retained in the food and in milk, eggs, and meat, the Committee said.

•

Dow, duPont, Stauffer File

Filing of petitions for establishment of residue tolerances by the following companies was announced late in August.

Stauffer Chemical Co., New York, requested a tolerance of 15 ppm for residues of the pesticide "Sulphenone" (p-chlorphenyl phenyl sulfone) on apples, peaches, and pears.

Dow Chemical Co., Midland, Mich., proposed a tolerance range from five parts per million for residues on apples, pears, and quinces to 200 parts per million on cottonseed, . . . where residues result from fumigation with methyl bromide.

E. I. du Pont de Nemours & Co., Wilmington petitioned for tolerances on four products: "EPN" (o-ethyl-o-p-nitrophenyl benzene thiophosphonate) three parts per million; "Ferbam" (ferric dimethyl dithiocarbamate), 0.1 part per million; "Zineb" (zinc ethylene bisdithiocarbamate) seven parts per million; and "Ziram" (zinc dimethyl dithiocarbamate) 0.1 part per million.

•

'55 AgChem Production Up

The USDA industry report for 1955 indicates that January-April, 1955, production and exports of pesticides were higher than comparable figures for the first four months of 1954. DDT output rose 22%; 2,4-D was 23% higher; and although data was not complete on 2,4,5-T, indications were that '55 output was higher than during the first four months of '54.

Manufacture of copper sulfate was 816,000 pounds higher, but April 30th stocks were only about one-third as large as a year ago.

Output of BHC was 34% lower than in the first four months of '54. Some of the newer insecticides are believed to be replacing BHC for specific purposes.

The USDA report suggests that the high production rate which prevailed for ammonia and its derivatives during the first 5 months of 1955 may have tapered off in June as the spring demand for fertilizer drew to a close. Inventories of anhydrous ammonia, were about 52,390 tons at the end of April, stocks of coke oven ammonia sulfate were about 82,464 tons; while stocks of synthetic ammonium sulfate and ammonium nitrate were 39,408 and 38,861 tons, respectively.

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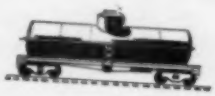

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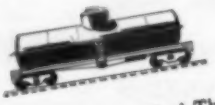
3 Nitrogen Solutions



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Washington Sprayers Hold Meeting At Wenatchee

THE first state wide convention of the Washington Association of Ground Sprayers, Inc., was held July 29th-30th, in Wenatchee, Wash., at which George Mock, Sprague Spray Service, Seattle, was elected chairman. Jennings P. Felix, attorney, was elected secretary-treasurer; T. A. Ziegler 1st vice president and Robert Dye, 2nd vice president.

The group organized in November. 1954, to effect more satisfactory legislation in the state through the presentation of bills on controls, licensing, testing, etc.

The Ground Sprayers Association reports that in the past year, it has obtained for its members more information on better insurance for the protection not only of the ground sprayers but of customers and bystanders . . . that it has obtained also substantial savings in the purchases of equipment and materials . . . and has served as a clearing house for new ideas on methods, equipment and technical knowledge.

At the two-day meeting in Wenatchee, A. Norris, Washington State Department of Agriculture, discussed "The Role of the Department of Agriculture. J. Bradford, Food Machinery Co., reported on new developments in equipment; and R. Rhodes, Rhodes Chemical Co., discussed "New Materials and New Uses for Old."

George Mock, Sprague Spray Service, outlined a "Proposed Summer and Fall Spraying Program for Ornamentals"; while Roderick Sprague, discussed "Systemic Insecticides and Fungi Control". The Importance of Formulations of Materials" was reviewed by Verle Woods, Crop King Co., and Robert Jones, Norkem of Yakima, discussed "Sequestrenes as an Additive to Fertilizer and Dalapon".

The following were elected as trustees of the Association: J. Beheyt, Kirkland, Wash.; J. Harshman, Mt. Vernon; Frank Scarbery, Seattle; Russell Faulkner, Auburn; and A. H. Hembree, Spokane.

Innes, Climax Mgr. of Sales

Appointment of George L. Innes as manager of chemical sales, was announced last month by Climax Molybdenum Co., New York. Before joining Climax, Mr. Innes was sales manger of the Jefferson Chemical Co., a joint subsidiary of the Texas Co. and American Cyanamid Co. Previously he had been associated with Nopco Chemical Co.; Ciba Co., Inc., and Monsanto Chemical Co.

NH_3 Plant Opens

Columbia - Southern Chemical Corp., Pittsburgh, marked its entry into the ammonia field with the recent opening of an anhydrous ammonia plant at Natrium, W. Va. The process used in the new plant involves the combination of hydrogen and nitrogen under high pressure. The hydrogen is obtained as the by-product of the electrolytic production of chlorine and caustic soda. The plant has a capacity of seventy tons per day.

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4 More Phosphate Plants Open

August 22, Lakeland, Florida. Four more of the 8 Florida phosphate plants which had been closed by strikes settled with workers in mid-August (see page 105).

Virginia - Carolina Chemical Corp.; Armour Fertilizer Works; U. S. Phosphoric Products, Division of Tennessee Corp., and F. S. Royster Guano Co., are back in operation.

Negotiations between International Minerals & Chemical Corp., and the union were continuing as of this date. Final company involved in the strike is American Cyanamid Co.

•

Control Officials Meet Oct. 14

The annual meeting of the Association of American Fertilizer Control Officials will be held at the Shoreham Hotel, Washington, D. C., October 14. The States Relations Committee meeting will be held on October 13th. Among the reports to be presented at the conference are the following:

"Plant Food Research as Related to Fertilizer Practices" by Dr. J. B. Pitner, Grace Chemical Co., Memphis.

"Ratios and Multiple Grades as Related to Soil Testing," by J. Fielding Reed, American Potash Institute, Atlanta.

"New Development in the Manufacture of Fertilizers" by Dr. E. C. Kapusta, U. S. Potash Co., New York.

"Complete Liquid Fertilizers" by R. B. Ellsworth, R. B. Ellsworth & Assoc., Indianapolis, Ind.

"Acquainting the Public with Our Program," by W. C. Winton, Oklahoma Department of Agriculture.

"Distribution of Bulk Fertilizer in 1953-54" by Walter Scholl, Hilda M. Wallace, and Esther I. Fox, USDA, Beltsville, Md.

Investigators will give formal reports on: Nitrogen Products (organic); Nitrogen Products, (inorganic); Phosphorus; Potash; Calcium, Magnesium and Manganese; Boron; Zinc and Copper; Mixing and Segregation; Specimen Labels; Tonnage Reports; Pesticides in Fertilizers; Specialty Fertilizers; and State Committee Reports.

•

Corn, Cotton Pest Damage Up

A critical build-up of boll weevils in a large area of the Cotton Belt is reported by the National Cotton Council, with severe damage in Mississippi, Louisiana, Tennessee, Texas, South Carolina and Oklahoma.

The report indicates that an unusual growing season is still producing plant growth and square development, providing food for heavy populations of weevils. "Control is a mounting problem," reports the NCC, "because rank growth makes it difficult to get into the fields with ground application equipment. Also, almost daily rainfall keeps machines out of the field; and even if poison is applied it is washed off before it has time to kill weevils."

The Council is urging farmers to stay on a 4 or 5-day schedule of dusting or spraying if at all possible.

Corn Insects

The USDA advised early in August that corn insects are causing widespread damage over the entire nation: earworms, European corn borer, corn leaf aphids and rootworms lead the list of injurious corn pests.

Alfalfa in Louisiana and heads of sorghum in Oklahoma, Arkansas and Texas suffer from corn-earworm attacks.

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Great Plains Agricultural NH_3 Assn—Field Day in Iowa

The Great Plains Agricultural Ammonia Association's Field Day held July 21, near Ames, Iowa, with

Dr. John C. Strauss, vice-president of Liquidlizer Corp., Vincennes, Ind., explains use of liquid fertilizers.

the cooperation of Iowa State College, drew several hundred farmers from all parts of Iowa—and some from neighboring corn belt states. The group viewed a 2-acre test plot that showed a comparison in corn fertilized with varying amounts of anhydrous ammonia and observed demonstrations of applicators. A surprise visit from members of the Russian farm delegation touring the U. S. emphasized the interest in modern fertilization methods. Dr. E. R. Duncan, Iowa State College Agronomist, had stressed the importance of a balanced fertilization program, favorable weather and good subsoil moisture in outlining "Fertilizer Needs of Corn."

Duncan was preceded by Professor C. J. Chapman, University of Wisconsin, who discussed the "Need for Nitrogen." He called nitrogen the "limiting factor" in growing crops and pointed out that the use of anhydrous ammonia is the most economical method of supplying it.

"Nitrogen is the No. 1 element our crops are crying for," he said. "We have been pumping it out of the soil for 100 years and we are about 25 per cent deficient."

It was during the discussion of "Proper Anhydrous Ammonia Equipment and Handling Methods," by Dale O. Hull, Iowa State College extension agricultural engineer, that the Russian visitors arrived. The Soviet agriculturists showed great interest in the many displays of anhydrous ammonia equipment and questioned sales representatives at length about this type of fertilization, practically unknown in Russia.

The Great Plains Field Day activities were held in conjunction with the group's third annual Midwest Trade Show, conducted at Des Moines, which was attended by more than 400 representatives of anhydrous ammonia distributors, producers and equipment manufacturers.

Trade show participants heard addresses by the Field Day speakers and Dr. John C. Strauss, vice-president of the Liquidlizer Corp., Vincennes, Ind. Strauss told his audience that "The time for application of complete liquid fertilizers is here," and emphasized the need for application of all plant nutrients, not only nitrogen. He cited ease of application of liquid fertilizers as one of their most popular features with farmers.

Plans for providing members with increased advertising, merchandising and publicity help were presented by Pax Shaffer, of the L. W. Ramsey advertising agency, who urged the group to become more "advertising conscious."

ACS Holds National Meet Sept. 11-16

AT its 128th annual meeting, September 11-16, 1955, the American Chemical Society is scheduled to welcome some 2500 members and guests at the University of Minnesota, Minneapolis. The following abstracts review the reports scheduled for presentation at the meeting of (1) the Division of Fertilizer and Soil Chemistry; and (2) Division of Agricultural and Food Chemistry.

Fertilizer Progress and Problems. Arthur M. Smith, Olin Mathieson Chemical Corp., Baltimore.

Fertilizer progress since 1940 can be marked by the following:

1. Old processes have been improved and new processes developed for producing fertilizers of high plant-food content.

2. This improved technology facilitated the increasing use of fertilizers and expansion into new areas.

3. Ammonia production has been expanded to meet actual and immediate potential demands. Previously known but little used economies of production have been put into effect.

4. Direct application of anhydrous ammonia to the soil has come into general use through new methods and equipment for applying. This has also indicated new uses for aqueous solutions of ammonia and soluble nitrogen compounds.

• *Ammonium Phosphate-Nitrate: Small-Scale Preparation in a Packed Tower.* A. V. Slack, J. C. Driskell, and H. K. Walters, Jr., Tennessee Valley Authority, Wilson Dam, Ala.

In producing fertilizers based on ammonium phosphate, the nitrogen to phosphorus pentoxide ratio can be adjusted by using some other acid along with phosphoric acid to tie up additional ammonia. An example is the use of sulfuric acid in making fertilizers of the ammonium phosphate-sulfate type.

Preheated nitric and phosphoric acids were neutralized with ammonia in the top of a packed tower that was operated at 160° to 200°C. Water was evaporated as the mixture flowed down through the tower, and the molten product contained less than 0.1% water. Products covering a wide range of nitrogen to phosphorus pentoxide ratios were produced with smoother operation than when ammonium nitrate alone was produced. The nitrate-phosphate melt could be prilled or flaked with ease. The product was equal or superior to ammonium nitrate in hygroscopic properties and was comparable to ammonium nitrate-sulfate in its freedom from hazard as a promoter of combustion.

Preparation of Liquid Mixed Fertilizer. A. V. Slack, J. C. Driskell, and H. B. Shaffer, Jr., Tennessee Valley Authority, Wilson Dam, Ala.

Fertilizer solutions corresponding in composition to standard mixed fertilizers are making rapid headway, yet there is little information in the literature on the production problems that these solutions present.

Since salting out is one of the major problems in making and using liquid fertilizers, materials were sought that would repress or delay crystallization. Screening tests of over 150 materials showed that small quantities of certain metallic ions, hydrophilic colloids, and ionic surfactants depress the crystallization temperature appreciably. Nonionic surfactants and dyes had little effect.

Electric-furnace phosphoric acid is normally used in the formulation of liquid mixtures, but wet-process acid ordinarily can be produced at lower cost. The problems in using wet-process acid are reviewed, and data are presented on the filtration of precipitated impurities and on the effect of sulfate from the acid on properties of the final solution.

Granulation of High-Analysis Fertilizers. L. B. Hein, G. C. Hicks, J. L. Silverberg, and L. F. Seatz, Tennessee Valley Authority, Wilson Dam, Ala.

Methods for production of granular, high-analysis fertilizers were developed in which the TVA-type continuous am-

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moniator was used in conjunction with auxiliary equipment. Combining the ammoniation and granulation steps permitted economies in equipment, economies of formulation based on increased proportions of lower cost nitrogen sources such as ammonia and nitrogen solutions, and economies in operation by granulating at low moisture content and using the heat of the ammoniation reactions to dry the products. The need for artificial drying was eliminated for high-nitrogen grades such as 10-20-20 and 12-12-12, and the extent of drying needed for other grades was decreased. Also, some work was done on granulation of formulations such as 6-12-12 and 5-20-20, which could not be granulated at low moisture contents. Water, steam, or both were added in the ammoniator to promote granulation, and the products usually required drying.

Some Effects of Formulation on Granulation of Mixed Fertilizers. John. O. Hardesty, Andrew Szabo, and Joseph G. Cummings, U. S. Department of Agriculture, Beltsville, Md.

The trend toward greater production of granular mixed fertilizers in this country is accompanied by the need for basic information on optimum conditions for agglomeration of a wide range of formulations. Accordingly, a laboratory study was made of the individual and combined effects of ammonium nitrate, ammonium sulfate, and potassium chloride contents on moisture requirement for optimum agglomeration and on agglomeration efficiency of mixed fertilizers at approximately 194°F.

Ammonium nitrate was most effective in decreasing the moisture required for optimum agglomeration followed by ammonium sulfate and potassium chloride in that order. An apparent direct relationship was observed between salt solubility and the rate of decrease in moisture requirement with increase in soluble salt content of the mixed fertilizer. Replacement of ammonium sulfate with ammonium nitrate equivalent to 7 units of nitrogen in ammoniated mixed fertilizers, prepared with either ordinary or triple superphosphate and potassium chloride as sources of phosphorus pentoxide and potassium oxide respectively, reduced the moisture requirement for optimum agglomeration from approximately 14 to 2% for 1:1:1 ratios and from approximately 16 to 6% for 1:2:1 ratios.

Relative Effectiveness of Coating Agents on Granular Mixed Fertilizers. Rikio Kumagai and John O. Hardesty, U. S. Department of Agriculture, Beltsville, Md.

Granulation makes possible the satisfactory use of many high-analysis mixed fertilizers that otherwise could not be used because of poor physical condition. Caking, however, still appears to be a problem in granular mixtures containing large amounts of soluble, hygroscopic salts. The present study reports the results of 400 laboratory caking tests on high-analysis, granular mixed fertilizer with and without the addition of some 20 different coating agents. Crushing strengths of cakes prepared from 12-12-12 fertilizer in the particle size range of 10- to 20-mesh (1.65 to 0.83 mm.) were reduced 14 to 100% depending on the agent employed as a 2% coating.

Diatomaceous earth, phosphate by-product, Fuller's earth, kaolin, magnesium silicate, and perlite reduced the crushing strengths of the cakes 70 to 100%; such materials as pyrophyllite, montmorillonite and powdered vermiculite 40 to 70%; and others such as spent Fuller's earth, less than 40%. One per cent of diatomaceous earth was as effective as 2% of such agents as pyrophyllite and powdered vermiculite. Tests generally showed that the ability of coating agents to reduce or eliminate caking of granular fertilizers is dependent on the initial moisture content of the mixture, particle size, and shape of the granules, and the kind and amount of agent used. The data should serve as a guide in the selection and use of coating agents for granular fertilizers.

Ammonium Metaphosphate Fertilizer: Pilot-Plant Production and Greenhouse Tests. J. M. Stinson, M. M. Striplin, Jr., N. A. Brown, and L. F. Seatz, Tennessee Valley Authority, Wilson Dam, Ala.

A continuous process for the production of a highly concentrated fertilizer from ammonia and phosphorus pentoxide was studied on a pilot-plant scale. The process consisted of reacting ammonia and

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phosphorus pentoxide vapor in the absence of moisture at temperatures of 600° to 800°F. and hydrolyzing the product from this reaction at about 250°F. with steam. The final product was granular, contained about 17% nitrogen and 73% phosphorus pentoxide, and was relatively nonhygroscopic. It was predominantly ammonium metaphosphate.

Dicalcium Phosphate Fertilizer by Treatment of Phosphate Rock with Mineral Acids or Monocalcium Phosphate. G. L. Bridged, Teodoro I. Horzella, and Kuang H. Lin, Iowa State College, Ames, Iowa.

The preparation of dicalcium phosphate fertilizer by direct acidulation of phosphate rock with mineral acids theoretically would require only one half as much acid to produce a unit of available pentoxide as by conventional acidulation processes in which monocalcium phosphate is the principal product, such as superphosphate processes. However, previous investigators have not found conditions under which dicalcium phosphate would be formed, except at high pressures and temperatures.

The present paper describes an atmospheric pressure process in which phosphate rock is treated with sufficient sulfuric or phosphoric acid to convert part of the rock to monocalcium phosphate, hydrolysis of the monocalcium phosphate to dicalcium phosphate and phosphoric acid takes place, and the unreacted part of the phosphate rock is converted to monocalcium phosphate and dicalcium phosphate by reaction with the phosphoric acid. Alternatively, phosphate rock may be reacted with monocalcium phosphate-containing materials, such as normal or concentrated superphosphate, to convert most of the phosphorus pentoxide to dicalcium phosphate.

Fertilizer by Fusion of Phosphate with Gypsum. D. R. Boylan and M. A. Larson, Engineering, Iowa State College, Ames, Iowa.

Phosphate rock containing 32.5% phosphorus pentoxide was fused with gypsum in various proportions in a gas fired laboratory combustion chamber and an electric arc tilting furnace. The molten product was quenched in water and subsequently dried.

Products of high phosphorus pentoxide (>90%) were obtained with mixtures of phosphate rock and gypsum in the proportions of 1 part rock to 2 parts gypsum. For the fusions in the gas fired furnace langbeinite, muriate, or glasserite was used as a flux in the proportion of 1/3 part. Higher proportions of the flux in the mixture resulted in a decrease in phosphorus pentoxide availability.

Typical products made by fusing a mixture containing 30% phosphate rock, 60% gypsum, and 10% glasserite contained at least 11% total phosphorus pentoxide and 10.5% available phosphorus pentoxide as determined by 2% citric acid. The products were granular, nonhygroscopic, and easily ground.

The section on Agricultural and Food Chemistry, included discussions on the following topics:

"A New Approach to Phosphorus Insecticides Related to Chlorthion" by S. S. Ristich and W. L. Butts.

"3,4-Methylenedioxyphenoxy Compounds as Candidate Synergists for Natural and Synthetic Pyrethrins" by Morton Beroza.

"An Evaluation of the Safety for Use of Captan in Warm Blooded Animals." By R. W. Fogleman and E. G. Batte.

"Uses and Effectiveness of Captan" by P. D. Peterson and J. T. Bashour.

"The Persistence of Insecticide Residues on Forage Crops" by R. H. Carter, F. W. Poos, B. A. App, and Ray E. Ely.

"Copper Dihydrazinium Sulfate — A New Plant Fungicide" by Joseph D. Campbell.★★

Conn. Station Honors Jones

Donald F. Jones, pioneer in the development of hybrid corn, was honored at the annual field day of the Connecticut Agricultural Experiment Station at the Experimental Farm, Mt. Carmel, on August 16th. Wagon tours and walking tours to 43 plots gave guests a chance to see field research underway.

FRONTIER CORPORATION
INSECTICIDE CHEMICALS

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(Benzene Hexachloride Technical: 13 to 15% gamma content)

from Wichita, Kansas

We are in the BHC business to stay. Production at our new basic plant at Wichita, Kansas, is steadily increasing. We are doing our best to meet your needs, from this advantageous location in Mid-America. We make no finished insecticides in competition with our own customers . . . only BHC. Our other products are basic chemicals and high-purity salt for stock feeding, water softening and industrial uses. We try always to surpass specifications . . . and render "plus" service to match. We believe that's the best way to show that we appreciate your business.

FRONTIER SALT
Frontier Chemical Company

- BHC, chlorine, caustic soda and muriatic acid from Wichita, Kans.
- High-purity salt, caustic soda from Denver City, Tex.; muriatic acid from Dumas, Tex.

THESE TRADEMARKS are your guide to basic chemicals of known quality . . . guaranteed by Frontier

FRONTIER CHEMICAL COMPANY
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A DIVISION OF UNION CHEMICAL & MATERIALS CORP.

Suppliers' BULLETINS

Home Garden Disease Booklet

The U. S. Department of Agriculture has recently issued a Home & Garden Bulletin #46, called "Insects and Diseases of Vegetables in the Home Garden". The 64-page booklet lists the use of insecticides and fungicides, spraying and dusting equipment, and precautions to be observed in the use of garden chemicals.

The bulletin is obtainable through the Superintendent of Documents for 25¢.

•

Antara Chemical Buln.

Antara Chemicals, New York, has just published an "Organic Chemical Catalogue," which is one of a series of brochures describing Antara's products. The organic chemicals listed are produced in commercial or semi-works quantities.

In the catalogue's index, each product is listed alphabetically under its chemical abstracts name and most common synonyms. In the data section, the chemicals are alphabetically arranged under the designation normally used by Antara.

•

New ACP Rodenticide

The American Chemical Paint Co., Ambler, Pa., announced recently a new rodenticide "Ratafin," which is based on the anti-coagulant fumarin. Ratafin is available to formulators in concentrated form to be diluted for use.

•

New Literature on Heptachlor

The current "Kill Cotton Insects" campaign being waged for Heptachlor insecticide dealers by Velsicol Corp., Chicago, has many sales aids to help sell this insecticide to the cotton growers.

A four-color mobile shows a boll weevil, thrip, cutworm, rapid plant bug, tarnished plant bug, and a cotton flea hopper in larger than life size. "Da-Glo" window banners and one and two column ad mats are available for dealers to use.

A thirty-two question and answer "Cotton Insect Quiz," available for distribution to growers, gives growers important information on cotton insects and their control. A new 12-page, 4-color folder utilizes true to life drawings of the insects to tell the complete Heptachlor story.

A new 8-page folder on grasshopper control showing effectiveness of Heptachlor in this application is available also. This folder provides information on the background, habits, and control of these pests.

•

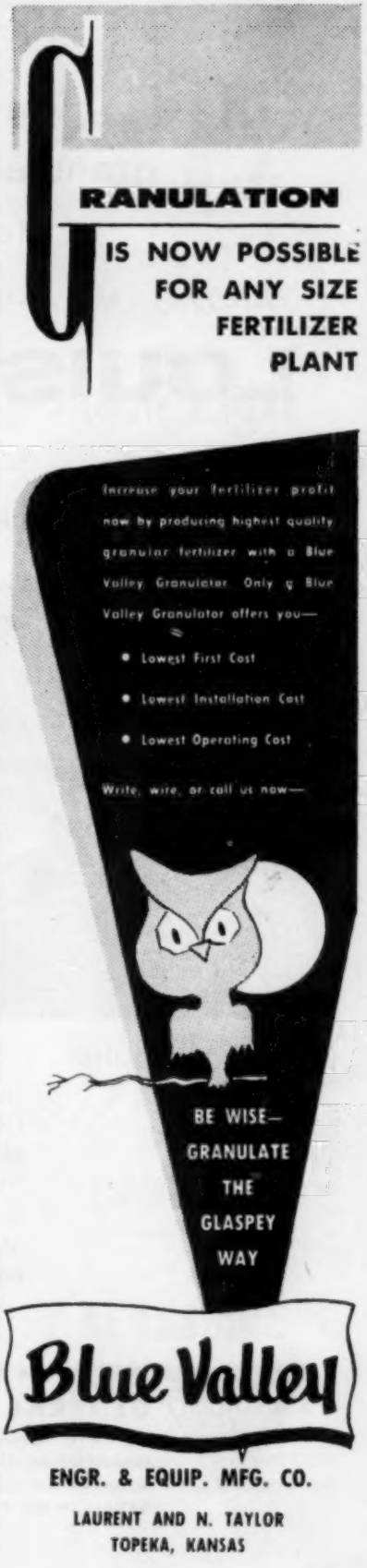
Omega Bulletin on Flow

Omega Machine Co., Division of B-I-F Industries, Providence, R. I. has issued a bulletin showing how its proportioning weir tank, for dividing the flow of a solution or a suspension to two points of application, provides savings in installation costs and plant space when supplemented by a single chemical feeder. In addition to information on the description, operation and control systems possible, the bulletin contains illustrative diagrams.

•

Chlorinated Solvents Bulletin

A 14-page technical bulletin reviewing its complete line of specialized chlorinated solvents has just been issued by the Chlorinated Products Division of Diamond Alkali Company, Cleveland, Ohio, and is now being distributed among chemical research, processing, purchasing, and other interested executives. Products discussed in the bulletin, entitled "Diamond Chlorinated Solvents," are methyl chloride, chloroform, carbon tetrachloride, and perchlorethylene.



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to speed production . . .

reduce drying costs

Installations are individually engineered for your problems. Results can be pre-determined in our pilot plant. We'll be glad to show you how the fertilizer industry has found a new way to efficient and profitable drying.

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In Canada: Canadian Locomotive Company, Ltd., Kingston, Ontario

OFFICES IN ALL PRINCIPAL CITIES

NEWS Brevities

M. K. CHEMICAL FOG SERVICE, Inc., was incorporated recently at Hutchinson, Kan., with capital stock of $8,000. Organizers are L. W. and Betty Jean Fleming, Hoisington, Kan.; Cora Keitel and Mamie O. Higgins of Hutchinson, Kan.

•

DR. LEONARD BROADBENT, entomologist and plant pathologist at the Rothamsted Experimental Station in England, is working with the Connecticut Agricultural Experiment Station in New Haven on the transmission of virus diseases.

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FERTILIZER USE IN CALIFORNIA has increased by 382% since 1940, as compared with an increase of 220% for the country as a whole, the California Fertilizer Association reports. Farmers of the state used 218,589 tons of commercial fertilizer in 1904, but in 1954 the total was 833,833 tons!

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DR. A. C. TODD, parasitologist of the University of Wisconsin, has reported development of an effective piperazine compound for control of roundworm in hogs.

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JOHN A. MCNIFF has been elected secretary of Mobay Chemical Co., St. Louis, a firm owned jointly by Monsanto Chemical Co., St. Louis and Farbenfabriken Bayer, A. G., Leverkusen, Germany.

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LOUISIANA AGRICULTURAL extension service announced recently the appointment of Woody Dry as assistant extensive entomologist.

•

HENRY E. WESSEL recently joined the Engineering Division of International Minerals & Chemical Corp., as assistant to the vice president.

Berkshire

SPECIALISTS

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MAGNESIA

for

AGRICULTURE

EMJEO (80/82% Magnesium Sulphate) Calcined Brucite (fertilizer grade) 70% MgO Calcined Magnesite 85 to 95% Mg O

POTNIT

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Special Mixtures and Soluble Fertilizers
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are turning to

LOUISVILLE / rotary dryers rotary coolers

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Installations are individually engineered for your problems. Results can be pre-determined in our pilot plant. We'll be glad to show you how the fertilizer industry has found a new way to efficient and profitable drying.

A Louisville engineer will survey your present operation without obligation on your part. Take advantage of Louisville's equipment and experience. Phone or write today.

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INSECTICIDES - FUNGICIDES

Mercury Compounds for Agricultural Use

DITHIOCARBAMATES

Ferric — Zinc

EXPORT-IMPORT

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Cable Address — "Berkskem" New York

greater sales potential in the years

more than half the total, produce only

MICHIGAN CHEMICAL CORP. figures for the six months ended June 30, 1955 showed net income of $0.25 a share of common stock as compared to a loss of $0.18 a share in the first six months of 1954. Sales for the period were $3,311,911 in the 1955 period and $2,934,962 in the 1954 six months.

* * *

SALES OF OLIN MATHIESON CHEMICAL CORP. in the United States and Canada increased approximately 12 percent in the three months ended June 30, 1955, compared with the like period last year; net income showed a gain of about 11 percent, according to the company's second-quarter report.

* * *

DOW CHEMICAL CO. has announced the appointment of L. A. Doan as assistant general manager of its western division. Mr. Doan has been the company's western sales manager for the past four years.

* * *

JAMES A. HUGHES has been named treasurer of Diamond Alkali Co., succeeding Arthur W. Crossley.

* * *

HARRY J. ULDRICKS has been appointed Mid-West sales representative for the Universal Paper Bag Co., with headquarters at Columbus, Ohio. Mr. Uldricks was associated previously with the Chase Bag Co.

* * *

THE MANUFACTURING CHEMISTS' ASSOCIATION, INC., announced the election of J. E. Hull as president of the Association. Mr. Hull is a former United States and UN commander-in-chief in the Far East.

MILLER LAW

(*From Page* 38)

more academic than real. In practice, a reasonable degree of usefulness has long been generally accepted as establishing necessity for use and for the past several years, in compliance with the provisions of the Insecticide, Fungicide and Rodenticide Act of 1947 (Sect. 2, U. 2(g)) the Secretary of Agriculture with the cooperation of the Food and Drug Administration has required reasonable proof of safety as a prerequisite to registration of a pesticide.

"The Miller Bill became Public Law 518 when it was signed by the President on July 22, 1954, which meant that unless certain extensions, which were provided for were granted, the tolerance provisions of the Act would become effective on July 22, 1955. Coming as it did in the middle of a crop-growing season, this effective date led to much confusion which was both embarrassing and distressing to all concerned. It takes time and much difficult and painstaking work to implement the activation and enforcement of a new law with all the implications and ramifications of the Miller Bill. The federal agencies involved had to develop their interpretations of the Act and then prepare adequate and appropriate administrative procedures and regulations. The chemical companies had to assemble, study, sort, and reassemble large volumes of data in the process of preparing their petitions for tolerances. Considering the fact that new procedures were involved, and that many precedents would be established as the work progressed, all of this work took more time than abstract planners might have anticipated. It was only natural that individual participants in this great cooperative effort tended to become critical of others. Representatives of industry at times felt the governmental agencies were slow in developing and issuing their regulations, and public officials on the other hand were prone to feel that industry was tardy in filing petitions. Be all that as it may, the interested impartial observer watching these operations from the outside can only marvel at what has been accomplished by both parties in a matter of a few short months.

"That much confusion would develop during the transition period was inevitable. When it come to mass education, our educational processes move slowly indeed, and unfortunately rumors and misinformation are often disseminated more rapidly than facts. The officials of governmental agencies and the large chemical companies, because of their long experience and training in such matters, were not easily misled or unduly disturbed by rumors and false reports. Unfortunately they were not the only persons affected. Away out at the end of the line we find the farmer whose crops were involved. Then, too, the literally hundreds of extension specialists, county agricultural agents and other agricultural leaders to whom the farmer looks for advice had a stake in the problem. These men, largely unfamiliar with the mechanics of developing and establishing official regulations, were on the firing line day after day. They were naturally easily disturbed by rumors and at times misled by false reports and misleading information. Thus at times the farmer was hard put to determine which of two conflicting reports to accept. Here again an observer standing at a vantage point is amazed at the rapidity with which false rumors were squelched and misinterpretations were corrected. By and large we have gone through the 1955 growing season, which might easily have been chaotic and disastrous had panic prevailed, with a minimum of confusion, inconvenience or serious error.

"At this point one can only conclude that the Miller Bill has been eminently successful and has fully demonstrated its practicality and value. Admittedly we do not as yet have officially established tolerances for all pesticides on all crops, but we are a lot closer to that goal. In many cases we are currently operating on temporary extensions of previously approved practices, sometimes erroneously referred to as unofficial tolerances or administrative rulings, but it is extremely doubtful if any pesticide usage so approved represents a hazard to public health.

"The Miller Bill, Section 408 of the Food, Drug and Cosmetics Act, is now the law of the land. It has been generally accepted as a good piece of legislation. If any critics remain, they should now direct their energies to determining how they can most economically and effectively attain full compliance with it.★★

INSECT DAMAGE

(*From Page 75*)

Populations in Wisconsin have been rather high in some areas. Several hundred hoppers per square yard were recorded in Lafayette and Grant Counties, with stops over the state averaging over 25 per square yard. Damage or potential damage to crops from grasshoppers was reported also by Colorado, New Mexico, Kansas, North and South Dakota, Texas, Arkansas, Illinois, Iowa, Tennessee, Florida, Maryland, Delaware and New Jersey.

Other cereal and forage insects which attracted attention during late July and early August included the fall armyworm, which became active in Colorado, Kansas, Missouri, Arkansas, Virginia, Maryland and Delaware. This insect was also active in Puerto Rico, causing damage to young cane, seedling horsetail beefwood, corn, tomatoes and pastures. The yellow clover aphid, which decreased some during the early summer, is on the build-up again in some areas. Rapid increases are reported from Tulare and Kings Counties, California. Local increases were noted in Arizona, New Mexico and Utah, and several new county records were reported by Utah. The yellow clover aphid was reported from Arkansas for the first time, having been taken July 12 from a mixture of crimson clover and alfalfa in Chicot County.★★

WASHINGTON REPORT

(*From Page 66*)

No. 1. Yet, some countries prohibit enrichment of flour. With the Government stepping up its drive to increase exports of agricultural commodities, officials hope that progress will be made.

* * * *

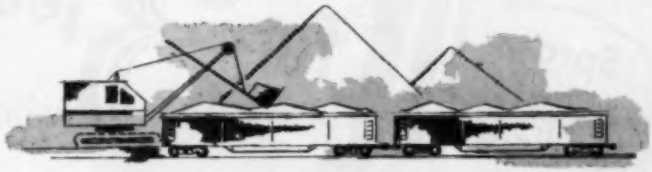
The farm market is getting even better according to the USDA. Despite some gloomy reports which point to declining farm income, there is evidence to show that agriculture isn't going to pot. Rather, it promises even greater sales potential in the years immediately ahead.

Here are a few figures to document this. During 1954, the incomes of farmers on a per capita basis increased from $914 to $918. This is the income per person from all sources. It includes all the money that farmers took in from the sale of farm commodities and from the pay checks they received for off-the-farm jobs.

Compared with the urban market, gloomy forecasters compare the $918 per capita farm income with the $1,836 per capita income for non-farmers. When you examine these two figures, certain facts should be kept in mind. The most important is that about 88% of our farm products are produced by the the two million farmers on what are often called our commercial farms. The other three and a half million farms, more than half the total, produce only 12 percent of the food and fiber which goes to market. These units are so small and produce so little that their incomes from farming are always low, good times or bad.

A somewhat startling dollar figure applicable to agriculture is obtained by taking the value of all property owned by farmers—land, buildings, machinery, feed, livestock, household goods, and all-and subtracting the debts owed by farmers on the property. You come out with an average equity of about $22,000 per farm family, according to USDA. The comparable figure for non-farm families is about $5,000 less, although these two figures should not be compared for obvious reasons.

One other good measurement of the agricultural situation is what it costs to buy a farm. Few things talk louder than money, and when applied



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NEW ORLEANS, LOUISIANA

to farm land, prices are holding steady. At present they are only 3% below the all-time peak reached in 1952. Actually, farm real estate values in the U. S. rose 2% last year. What's more, farm debts in general are at a moderate level—equalling 11% of the total assets. Just before the war, they were 19% of the assets and in 1930, 21%.

On the matter of price supports, it's interesting to note that only 20% of farm income is from the five crops affected by the new Agriculture Act of 1954. They are wheat, cotton, corn, rice, and peanuts. Peanuts will continue to be supported at 90% of parity. Price supports for the 1955 crops have been lowered under the Act for wheat, corn, and rice. Even, so, it's probable this will not have the huge effect on farm income that some have predicted.

To further shore up the agricultural markets, the USDA has two billion dollars more to loan for price support operations. Congress raised the total authorization from ten billion dollars to 12 billion dollars. Consequently, agriculture is in a reasonably good position. Certainly the patient is not on the critical list.★★

Triangle Brand Copper Sulphate has been recognized as an effective agricultural chemical for more than sixty years. In sprays (where Bordeaux mixtures are the most reliable), in dusts (if you prefer them) and in fertilizers (for additional enrichment of the soil) Triangle Brand Copper Sulphate has proved itself worthy and dependable. Try these Triangle Brand forms of Copper Sulphate:—

INSTANT (powder) for quick and efficient mixing of Bordeaux sprays.

SUPERFINE (snow), SMALL or LARGE CRYSTALS, all containing 25.2% metallic copper.

BASIC Copper Sulphate in powder form, containing 53% metallic copper.

Write for booklets that will help you solve your agricultural problems.

Control POND SCUM and ALGAE with Triangle Brand Copper Sulphate. Write today for information on how it can help you maintain healthy water conditions.

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NAC SPRING LAKE

(*From Page 47*)

Gordon Dairy Farm, Plainsboro, N.J., reported to be the world's largest scientific dairy. Guides will describe in detail how fertilizer and pesticide practices, including control of aphids and leafhopper aid in the operation of the dairy.★★

YELLOW CLOVER APHID

(*From Page 62*)

In the heavily infested Pecos Valley of New Mexico, none of the insecticides except Systox gave control for more than 5 days. Systox was effective for 10 days to 2 weeks.

The following discussion is based on work conducted by the Arizona and California agricultural experiment stations.

In California, sprays of parathion at 2 to 4 ounces and malathion at 8 to 12 ounces per acre have been used extensively to control the yellow clover aphid on seedling alfalfa. On alfalfa being grown for hay the per-acre dosages are 4 ounces of parathion and 8 to 12 ounces of malathion. On seed alfalfa, toxaphene as recommended for lygus bug control has been effective against the aphid. Dusts may be more satisfactory than sprays on this crop because of better penetration to the lower part of the plant, where the insect prefers to feed. Systox at the rate of 4 ounces per acre has been used also on alfalfa in California.

In Arizona, malathion and parathion dusts have been the most effective. Best results were obtained when all infested fields within an area were treated, and when the crops were thoroughly covered with the insecticide. A dust can be applied with a ground duster that is equipped with a canvas trailer, or by airplane. The best time to use a ground duster is in

the morning or in the evening when the wind velocity is less than 4 miles an hour. A 5-percent malathion or 2-percent parathion dust can be applied at the rate of 12 to 15 pounds per acre with a ground duster, or at 20 pounds by airplane.

A malathion or parathion spray is recommended also for use in Arizona. It should be applied with a ground sprayer that has a pressure of 80 to 100 pounds per square inch in order to force the insecticide to the underside of the alfalfa leaves, where the aphids feed. One pint of a malathion emulsifiable concentrate containing 5 pounds of the insecticide per gallon or a 25-percent parathion emulsifiable concentrate in about 6 gallons of water per acre is recommended.

If the alfalfa is grown for seed only, the grower may use DDT, toxaphene, or toxaphene mixed with sulfur or with both sulfur and DDT.

Caution

Alfalfa should not be fed for 15 days after application of parathion or malathion. Hay or chaff from fields of alfalfa treated with DDT or Systox, or with toxaphene at a dosage above 1½ pounds per acre should not be fed to dairy animals or animals being finished for slaughter. Alfalfa treated with toxaphene at a lower dosage can be fed 40 days after application.

Most insecticides are poisonous to people and animals. Store insecticides where children, pets, and livestock cannot reach them. Handle them with care. Follow all directions, and heed all precautions on the labels.

INDUSTRY RESEARCH

(*Continued from Page 31*)

some of the best industrial research anywhere.

Moreover, he can be sure that he is selling a bargain. Agricultural chemicals are absolutely essential to today's agriculture if we are to continue to enjoy the sure and abundant food supplies we have today. Many modern crops could not be produced, or at least could not be produced in necessary amounts, without agricultural chemicals. As a rule of thumb, a dollar invested in agricultural chemicals should bring back two dollars to the farmer who uses those chemicals correctly.

Many problems lie ahead of the industry at every level. Many unfortunate marketing practices continue and some of them have been expanding recently. While this may be considered normal in a highly competitive business like ours, it is also unfortunate. Some of the practices are injurious to everyone in the long run, and offer very limited advantage to anybody.

The outlook for sales in the future looks very bright. Research is constantly seeking new products which will give the farmer even better new chemical tools with which to carry on his operation.

The manufacture of agricultural chemicals has never been a high-profit undertaking. In today's market, the pressure is even greater. High efficiency is required to be sure of satisfactory return on investments in both production facilities and research. The industry, in general, is preparing to solve the problems, and claim the opportunities of the future by offering better products, better service, and better results to users of products.★★

TDE, DDD, RHOTHANE

(*From Page 85*)

Patch tests on man for skin irritation and sensitization using 30 per cent solutions of TDE and DDT in dimethyl phthalate gave negative results (8).

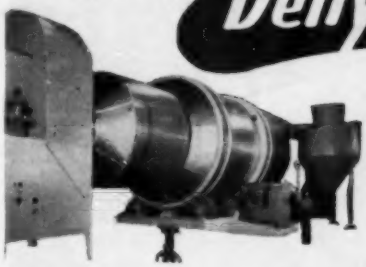
(*c*). *Inhalation Toxicity.*

1. DUST ATMOSPHERES.

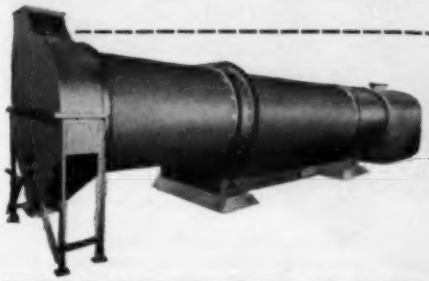
Experiments have been made with dusts containing 10 per cent TDE or DDT in Pyrax plus 3 per cent Santo-Cel, in which dust atmosphere concentrations of 0.30 to 0.58 mgm. of active ingredient per liter of air were generated (8). Dogs, rabbits and rats were exposed to these atmospheres for two hours a day,

Fertilizers are Dried Quickly, Economically

in.... DehydrO-Mat PAT. PENDING



Steam-heated DEHYDRO-MAT
Low temperature, variable-inclination, rubber-tired DehydrO-Mat dries ammonium nitrate and other hard-to-dry chemicals requiring hours of hold-up time.



CONVENTIONAL DRYER
Heavy-duty rotary unit with furnace, burner, breeching and air-handling system. Used for ammoniated granular fertilizers and other chemicals.

Literature and information on request.

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Baltimore 24, Maryland, U.S.A.

5 days a week, for 4 to 5 weeks. In dogs and rabbits, no definite difference in toxicity between the two materials was found, and control experiments with the Pyrax plus Santo-Cel diluent showed that it contributed to the over-all adverse pulmonary effects observed. On rats, the DDT containing atmospheres were definitely more toxic than those containing TDE, as judged by mortality, survival time and weight changes.

2. Spray Atmospheres.

Comparative studies on TDE and DDT as 2 per cent solutions in Ultrasene, and as water emulsions made from 25 per cent TDE in PD-544-C plus 5 per cent Triton X-155-M as the emulsifying agent, have been carried out (8). Animals were exposed to spray atmospheres of these materials for 2 hours a day, 5 days a week, for 4 to 6 weeks.

In the case of the Ultrasene sprays, atmospheric concentrations in the order of 0.2 to 0.3 mgm. of TDE or DDT per liter of air, produced lethal effects on repeated exposure of the animals (rats), DDT presenting a somewhat greater toxicity hazard than TDE. Control studies with the emulsion base alone showed that it was not an important toxicity factor to rats, but was sufficiently toxic to dogs so as to prevent their being used in the experiment.

Additional information concerning toxicologic hazards of DDT-containing atmospheres is available (10, 11), but since toxicity varies with the vehicle or solvent, no dependable comparison with TDE can be inferred.

Potential Hazards Due to Consumption of Residues

(*a*) *Absorption From the Gastrointestinal Tract.*

QUANTITATIVE studies on the feces of dogs receiving TDE or DDT by oral administration indicate that 90 per cent or more of both materials are absorbed into the body (12).

(*b*) *Storage In Body Tissues Following Absorption.*

Studies on rats receiving 0, 1, 5, 10 and 50 p.p.m. of TDE in their diet for 4, 8 and 12 weeks as well as for 12 weeks followed by 4 weeks withdrawal gave the following information concerning storage of the material in the body fat (13): With the possible exception of male rats receiving 1 p.p.m., storage of TDE occurred at all levels fed. Increased content of TDE in the diet resulted in an increase in the degree of its storage. With continued ingestion of TDE, its accumulation in the fat was progressive over at least a 12 week period. Female rats accumulated TDE in their fat more rapidly than males. On withdrawal of the dietary source of TDE, the body fat content of TDE decreased markedly in a 4 week period.

Comparing this with data published for DDT (14), it appears that both materials are stored quite similarly in body fat, the major difference being that TDE disappears more rapidly when dietary intake of it is discontinued.

Comparative studies on tissue storage of TDE and DDT have been made on dogs receiving 25 mgm. per kgm. per day of these materials orally for 2 and 4 weeks (12). Fat was found to be the major site of storage of both materials. Skin and adrenal tissue had the next highest content and small but measurable amounts were found in several other tissues. Analyses on pups, born to some of the dogs during the course of the experiment showed that both TDE and DDT cross the placental barrier. Other studies of DDT in the dog (15) have shown accumulation in the body fat as well as its secretion into the milk.

(c) *Effect on Survival.*

Chronic feeding studies on the effect of addition of TDE to the diet of rats have shown that survival is affected at a concentration of 5000 p.p.m. but not at 2500 p.p.m. (8). For DDT, decreased survival has been reported on 500 p.p.m. (16), 400 p.p.m. (17) and 600 p.p.m. (8). In studies on dogs receiving TDE dissolved in corn oil administered in capsule form, death has resulted from a daily dose level of 50 mgm. per kgm. of TDE (18, 7). By this form of administration, DDT has also been reported as causing death in the dog at a 50 mgm. per kgm. dose level (19). Additional studies on dogs fed TDE in their diet in concentrations as high as 1000 p.p.m. for two years (7) or 1650 p.p.m. for 19 months (29) resulted in no adverse effect on survival.

In the rabbit, daily oral administration of TDE (1) or DDT (1, 20) in a dose of 50 mgm. per kgm. dissolved in olive oil also produces lethal results. The effect on mortality of lower doses has not been reported.

(d) *Effect on Growth.*

Chronic feeding studies on the addition of the TDE to the diet of rats indicate depressed growth at 1800 p.p.m. but not at 1200 p.p.m. (8). With DDT depressed growth has been reported in female rats at 400-800 p.p.m. and in male rats at 800 p.p.m. (17).

(e) *Pathology.*

In the rat, the most outstanding histopathologic effects from both TDE (8, 21) and DDT (8, 14, 17, 21, 23, 24) occur in the liver. These have been summarized as consisting of centrolubular hepatic cell enlargement, with an increased oxyphilia, peripheral margination of basophilic granules and a tendency to hyalinization of the remainder of the cytoplasm (14, 17, 21). The lowest dietary levels at which this has been noted to occur are 100 p.p.m. for TDE (19) and 5 p.p.m. for DDT (14, 19).

In the dog, TDE produces a rather unique pathologic effect. This consists of adrenal cortical atrophy (18), a finding that has been repeatedly confirmed (7, 24, 25). The atrophy involves chiefly the zona fasciculata and zona reticularis, the zona glomerulosa being best retained. Attempts to reproduce this effect in other species by oral administration of TDE have failed; mice, (18), rabbits (18), monkeys (18, 30) rats (8, 18, 26). One exception to this has appeared (27). In this case, the TDE was administered parenterally to rats as a 50 per cent solution in peanut oil or as an emulsion stabilized with Tween 80. The distribution of the atrophy differed from that found for the dog, the zona fasciculata and zona glomerulosa chiefly involved, and the zona reticularis being hypertrophied. Attempts to confirm this in rats (31) or mice (32) have thus far been unsuccessful.

Although adrenal cortical atrophy has not been produced by oral administration of TDE in the rat, evidence has been obtained that it can depress the functional activity of the gland in this species (26).

Owing to the therapeutic potentialities of this effect of TDE, one report has appeared involving its administration to a woman with Cushing's syndrome (28). A total of 127 gm. of TDE was given orally in three courses of treatment. No clinical or biochemical evidence of suppressed adrenal cortical function resulted, and a biopsy of the gland gave no histologic indication of atrophy. No toxic effects were noted from the TDE at a 35 mg./kg. daily dose. At a 63 mg./kg. per day dose, depression, headache, giddiness and nausea developed.

Some indication of the dietary level of TDE required to produce adrenal cortical atrophy in the dog has been obtained from studies in which dogs were fed diets containing 100, 500 and 1000 p.p.m. of TDE for six months to two years (7). Moderate atrophy resulted in the dogs receiving 1000 p.p.m. and slight atrophy in the ones on lower levels. The degree of atrophy did not seem to become progressively greater after the first six months of exposure.

At daily dosage levels of 50 mgm. per kgm. and greater of TDE, moderate to severe fatty degeneration of the liver, with moderate centrolobular atrophy had been reported (18). This was not observed in the series of dogs described above that were given 100-1000 p.p.m. of TDE in their diet for six months to two years (7). The corresponding effect of DDT on the liver of the dog is one of central necrosis (23).

In arriving at an estimate of potential hazards, the above data must be considered in the light of known spray residues and the extent to which foods bearing TDE residues will be found in the diet. The Food and Drug Administration has established a tolerance of 7 p.p.m. for TDE on a number of food crops, (33). When the extent to which TDE is applied to such foods and the proportion of such foods in the total human diet is considered, it is quite clear that the probable human intake of TDE would be well below 1.0 p.p.m. of the diet. In the light of the toxicity reported for the compound, it appears highly improbable that the use of TDE constitutes any hazard to the consumer.

Summary and Conclusions

TDE is used extensively as an agricultural insecticide but less widely than DDT.

TDE on an overall basis is less toxic than DDT.

TDE should offer no significant

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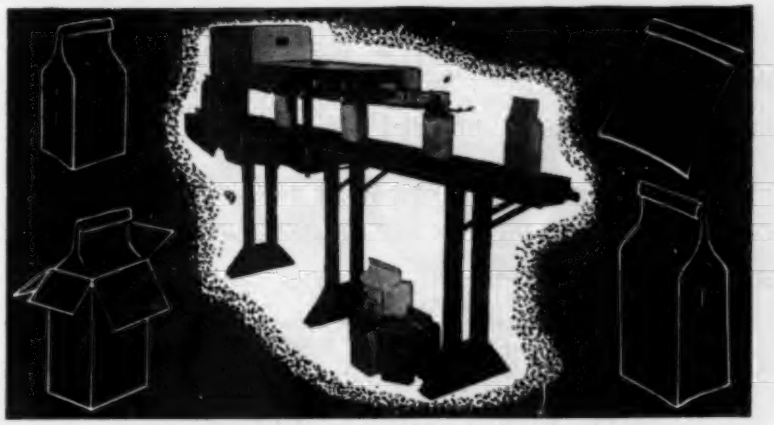

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with metal exposure will result with

The Plexiglas sheet was destroyed

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hazard to the agricultural worker if used in accordance with good agricultural practice.

A legal tolerance of 7 p.p.m. for TDE on certain food crops has been established.

In view of the fact that the probable human intake of TDE would be below 1 p.p.m. of the diet, it seems highly unlikely that it will constitute any hazard to the consumer.

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CORROSION TESTS

(*From Page* 51)

face is de-greased and washed properly. It is ideal for aircraft in that the surface is very smooth, pliable, and shock resistant. The finish is readily attacked, however, by Aramite, TEPP, Parathion, 2,4,5-T, Dieldrin, carbomated, and Heptachlor solutions. Bonding properties are not rigid when a surface scratch arises and a creep

with metal exposure will result with a majority of materials tested.

In atmospheric tests the vinyl-based finish on 4130 chrome-molybdenum steel was attacked very rapidly by the TCA solution. Poor bonding was caused by the potassium cyanate solution (high concentration), and magnesium chlorate solutions(high and low concentrations). An ammonium sulfamate environment softened the finish at 73 days exposure.

24S-T3 Alclad aluminum alloy used in conjunction with the vinyl-based finish showed relatively poor bonding properties after a scratch was placed on the coupon. It should be noted that the TCA solution does not actually destroy or react with the vinyl finish but reacts with the metal under the finish through scratch areas.

Modified Chlorinated Rubber Finish.—Modified chlorinated rubber on aluminum was generally unacceptable in solutions that showed destructive properties on other finishes. This finish was tested in a partially submerged environment only and therefore no data on the atmospheric aspects are available.

Liquid Neoprene Finish. — A Neoprene finish on 4130 chrome-molybdenum steel is unacceptable for any length under submerged conditions.

Under atmospheric conditions the Neoprene finish on 4130 chrome-molybdenum steel demonstrated excellent properties in all solutions for 30 days. At the end of the 30 day period the TCA and ammonium sulfamate solutions caused slight blistering effects. At 50-65 days the following environments loosened the bonding at the scratch areas: Aramite, Toxaphene, sulfur dust, cyanates (high concentration), 2-4-D, and the Bordeaux mixture.

Plexiglas and Vinyl Sheet.—TEPP, Aramite, and Parathion solutions attacked the vinyl plastic in much the same manner that they attacked the vinyl plastic-base applied finish. Softening effects were noted rather quickly with Parathion, whereas Aramite and TEPP commenced to discolor and soften the coupons at 10 to 17 days, respectively. The Plexiglas sheet was destroyed in six days by the TCA solution. All properties of a clear plastic were lost by the test material. The cyanates, cyanamides, and Parathion solutions caused discoloration in the Plexiglas but no softening was evident.

Polyester Resin.—The two makes of fiberglas-reinforced polyester plastic were tested for 40 and 50 days, respectively. Excellent resistance to all solutions was demonstrated during this period.

Rotational Test Data was accumulated for a period of 79 days and during that period 26 various solutions were applied to the materials and finishes tested. Three finishes demonstrated excellent properties: furan finish, epoxy finish, and the vinyl finish. This type of test is a rigorous test but a longer time period should be used. The data on these tests do indicate that all material should be cleaned thoroughly after use.

Conclusion and Recommendations

THE results of this investigation indicate that none of the applied coatings tested provide a perfect corrosion-free finish against all of the agricultural chemicals. The furan finish with the butyral wash primer, however, demonstrated excellent resistance to the vast majority of chemicals tested. Wider recognition of this type of finish should be observed since its physical properties are suitable for aircraft. The furan finish as used in this project was easily sprayed, brushed, or dipped, and no trouble was encountered during application.

Of the structural materials tested, only two, type 302 stainless steel and polyester plastic reinforced with fiberglass, showed complete resistance to all of the solutions investigated. Either of these materials should be very satisfactory for tank or hopper construction if weight requirements can be met.

Stainless steel appears to be the best material available for corrosion-free piping and plumbing systems. Monel metal, which is easier to machine, showed up reasonably well, however. Brass, aluminum alloy, and chrome-molybdenum steel were all

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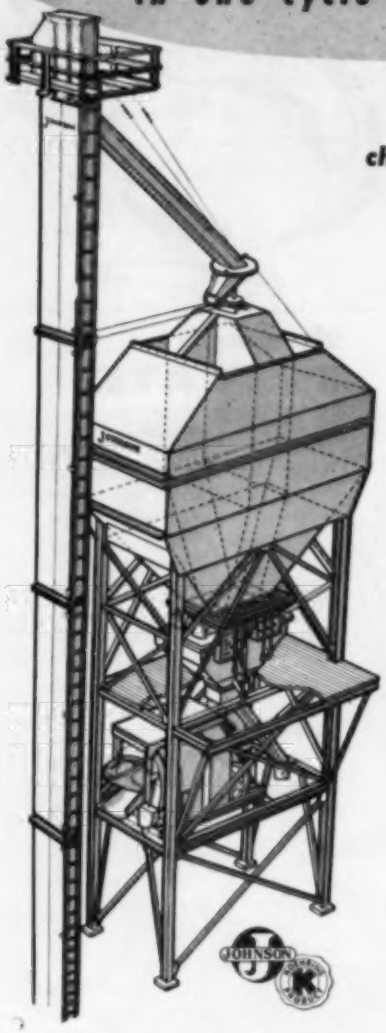

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- Clod breaker, with short belt conveyor, vibrating screen and collecting hopper can be installed between elevator head-section and overhead storage bin.
- Reject pipes can be added to automatically return oversize materials from the separating screen to elevator for re-sizing.
- Pivoted distributor directs flow of screened material from collecting hopper into storage bin.
- Johnson 100 to 200 cu. yd. Portable Section Bin, shown here, accommodates five materials — has four sections arranged around a central compartment.
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destroyed by certain of the agricultural chemicals.

Since most of the tanks and hoppers already constructed are of an aluminum alloy, the possibility of using an inhibitor with such extreme corrosives as TCA should be investigated. It is recommended that tests be set up using various percentages of sodium chromate and sodium dichromate in solution with TCA. Aluminum of all types should be tested. This particular inhibitor will possibly work with such compounds as sodium cyanamides also.

The rotation tests, in which the specimens were treated with each of 26 chemicals for three day periods and washed with water in between, indicated that most all of the materials would stand up reasonably well if they were cleaned thoroughly after each use.★★

PESTICIDES ON PAN

(*From Page* 40)

We would also be interested in knowing what research work you have done and what research papers you have published on the subject, and I don't mean articles simply giving your opinion on the subject, but rather the results of specific research work done by you, where and under whose auspices.

I should be much interested too in learning whether any substantial group in the medical profession share your beliefs about the connection between insecticide use and the increased incidence of the diseases to which you refer. And as to the DDT syndrome mentioned in your article, and which you note has "occurred repeatedly in hundreds of instances," would you say that it is rather unique for one doctor to have had so many cases of this particular type, or do other doctors generally recognize and identify the same syndrome, resulting from the same cause, in as high a percentage of cases?

It will be greatly appreciated if you will let us have an answer to the various questions at your convenience. And perhaps you might have some comments of your own to add to our discussion of the subject scheduled for our September issue. We would be glad to call to the attention of our readers any of your recent findings of fact on the topic in question.

Sincerely,

AGRICULTURAL CHEMICALS

To date we have had no reply from Dr. Biskind to our letter.★★

A Good Word For Pesticides

It is not news when pesticides are under attack in the public prints. But it definitely qualifies as a "man bites dog" story when someone has a good word to say for the industry's products in the daily press. We are happy to report such a column by Dr. Theodore R. Van Dellen in the July 19th issue of the New York *Daily News*.

Noting that "there are many vicious rumors about poisonous effects of DDT going round," Dr. Van Dellen observes that "they are kindled by hysteria and not fact." He refers to the remarkable record of DDT, noting that not one single case of acute DDT poisoning has resulted since the product was put into wide general use about ten years ago.

As to possible hazard from continued ingestion of small quantities on foods, Dr. Van Dellen observes that "the proof of the pudding is in the eating. If DDT were as harmful as its enemies say, scientists and the public would have heard by now of cases of the various diseases blamed on the insecticide."

"Some workmen," he notes, have been engaged in the manufacture and formulation of DDT for eight or more years. Despite this extensive occupational exposure, they are in good health. We may assume that these workers use adequate precautions."

Trade Mark Applications

GRO GREEN, in open-faced capitals within circle, for fertilizer. Filed Oct. 9, 1954, by Buffalo Meat Products, Inc., Buffalo, N. Y. Claims use since Sept. 1, 1951.

LUSTRE WONDER, in script letters, for liquid plant food. Filed Oct. 25, 1954, by Stanton Co., Holland, Mich. Claims use since Dec. 1, 1953.

WASHCO, in capitals forming semicirle, for fertilizers. Filed Nov. 29, 1954, by Washington Co-Operative Farmers Assoc., Seattle, Wash. Claims use since about Jan., 1954.

JACK AND THE BEANSTALK, in open face capitals for liquid fertilizer. Filed Nov. 19, 1953, by Clover Chemical Co., Eightyfour, Pa. Claims use since Sept. 17, 1953.

D, in green but with no claim made to the color, for fertilizers, mixed fertilizers, and superphosphate. Filed Nov. 25, 1953, by The Davison Chemical Corp., Baltimore, Md., now by merger W. R. Grace & Co., Norwalk, Conn. Claims use since on or about 1943.

BLACK DIAMOND, in capitals arranged as segment of circle above drawing of a diamond, for soil conditioner. Filed Mar. 22, 1954, by Cassell D. Hibbs, d. b. a. Hibbs Associated Industries, Fort Worth, Tex. Claims use since Jan. 20, 1954.

VITA TONE, in lower case letters, for fertilizers, chemicals for treating the soil, gypsum, and soil sulfur. Filed Sept. 8, 1953, by Leffingwell Chemical Co., East Whittier, Calif. Claims use since May 15, 1947, on fertilizers and chemicals for treating the soil.

MURDER, in capitals ascending from left to right, for insecticides. Filed April 20, 1954, by Valmor Products Co., Chicago, Ill. Applicant claims ownership of Reg. No. 332,777. Claims use since Nov. 6, 1929.

SEYMOUR PROCESS

(*From Page* 87)

curing the manufactured products for prolonged periods, and the demand for a free flowing granular product represent a significant portion of the fertilizer cost. A reduction in the cost or elimination of any of the above can result in savings to the customer.

The "Seymour Process" mixed fertilizers are produced by reacting various combinations of calcium metaphosphate, sulfuric acid, and water with subsequent ammoniation, potash addition and incorporation, drying, cooling, classifying, and packaging. "Pile" or "bin" cure is not required for the manufacture of free-flowing, granular products by this process.

The lower fertilizer costs possible through utilization of the Seymour Process are not confined to savings accrued by elimination of the bin cure stage and by other improvements in process techniques and methods. Appreciable savings are also found in ingredient costs. The per unit savings will vary according to grade or formula variation. One example of ingredient cost reduction in an Illinois plant shows approximately 9¢ per unit savings in a Seymour Process high analysis 1-1-1 ratio, when compared to a conventionally produced high analysis 1-1-1 ratio.

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We have mentioned the feasibility of producing any common "P", "P-K," "N-P," or "N-P-K" ratio fertilizer by the proper selection of one of these processes. Extreme flexibility is possible through variations in formulations and ingredients. Examples of high analysis common ratios which have been produced experimentally in pilot plant are 14-14-14, 6-24-24 and 10-20-20.

One 14-14-14 formula uses the following pounds of ingredients to manufacture one ton of product:

Calcium metaphosphate	(64%)	441.6 lb.
Sulfuric acid	(60°B.E.)	510.8 lb.
N Solution B	(40.8%)	693.2 lb.
Potash	(62%)	456.2 lb.
Water		60.0lb.

An examination of the flow diagram, Figure 2, reveals the general details of the process. Calcium metaphosphate, sulfuric acid, and water are proportioned in various combinations into a mixer. The heat of solution of the sulfuric acid and the presence of this strong mineral acid promotes hydrolysis of the calcium metaphosphate. Subsequent sulfuric acid reaction with the calcium metaphosphate hydrolysis product yields two moles of phosphoric acid for each mole of sulfuric acid used. The hydrolysis-acidulation reaction mixture is transferred to an ammoniator and reacted with an ammoniating agent. A potassic ingredient may be added to the reaction mixture in the ammoniating agent. A potassic ingredient may be added to the reaction mixture in the ammoniator if desired. Both granulation of the product and partial drying of the product occur in the ammoniation phase of the process. Subsequent processing involves conventional cooling, transfer, classification and packaging.

The process offers the following advantages:

1. Produces a dry, granular, free flowing, high analysis, homogeneous product.
2. "Pile" or "bin" curing period is eliminated.
3. Utilization of less expensive ingredients.

4. High water soluble P_2O_5 values.
5. Utilization of the heat of reaction to dry and granulate the product (a costly external source of heat is not required.)
6. Extreme flexibility permits the easy manufacture of products of high analysis and conventional ratio.
7. Reduced "fixed" costs and labor costs.
8. Elimination of various other process phases necessary for the conventional manufacture of mixed fertilizers.
9. Conservation of national sulfur resources.★★

PEANUT STORAGE

(*from Page 63*)

Mixing directions when formulated on the job:

Concentrate (5-50) .....1 pint
Tetrachloroethylene .....6 pints
Deodorized kerosene .....9 pints

Application rate:

2½ pints per 10,000 cubic feet of space over the load, or 5 gallons in average warehouse 100 x 100 feet, with 15 to 20 feet of space above the load.

There are two general classes of aerosol generators, mechanical and thermal. The mechanical types are generally smaller in size, have less capacity, and generate an aerosol with larger particle size. These are most suitable for use in individual warehouses. The thermal types are mostly larger, and are suitable where a number of warheouses are to be treated with one machine. Any type is suitable provided the proper formulation is used as discussed herein. The generators should be set for small particles, about 5 to 10 microns mass median diameter. The aerosol should be released into the building from the windward side so that good distribution will be obtained.★★

OAK WILT FUNGUS

(*From Page 73*)

Complete inhibition of fungus growth occurred at a concentration above 10 micrograms per milliliter; however, 1 microgram per milliliter reduced growth one-third and practically all of this growth was submerged, indicating that the antibiotic did not penetrate below the agar surface. Transfers of mycelium, 16 days after treatment with 100 micrograms per milliliter, yielded viable colonies of *Endoconidiophora fagacearum*.

The ability of Acti-dione to prevent mycelial growth into sprayed sapwood was examined also. The bottom portions of red oak sapwood slants were washed with spore suspensions of two different Pennsylvania isolates, placed in sterile flasks containing wheat bran broth, and incubated at 25°C for 10 days. The maximum extent of growth up the slants was measured, then some of the slants were atomized to the margin of mycelial growth with Acti-dione (1 and 10 micrograms per milliliter distilled water) and incubated at 25°. Growth was recorded 5 and 10 days following atomization. The Acti-dione sprays reduced mycelial growth and development 50 percent at 1 microgram per milliliter, and 90 percent at 10 micrograms per milliliter.

The investigators conclude that Acti-dione was the most toxic to spore germination and growth of *Endoconidiophora fagacearum* of the five chemicals tested. Spore germination and mycelial growth were equally affected when the chemical was dissolved in agar. Mycelial growth already established in liquid was inhibited 76 percent by 0.01 micrograms per milliliter of Acti-dione. Growth resulting from spores germinating on agar containing an equivalent concentration was inhibited 69 percent, a remarkably similar result. Acti-dione was less effective when sprayed onto mycelium when it was added to the agar liquid medium in which the fungus was growing. This result may be due to failure of the chemical to penetrate equally into all parts of the mycelium in the former case. Acti-dione 10 micrograms per milliliter sprayed onto oak sapwood reduced mycelial invasion by 90 percent, thus giving some promise of usefulness in

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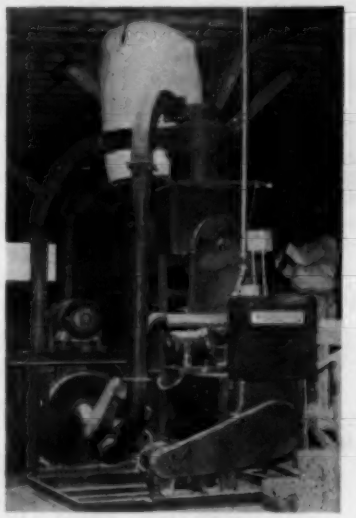

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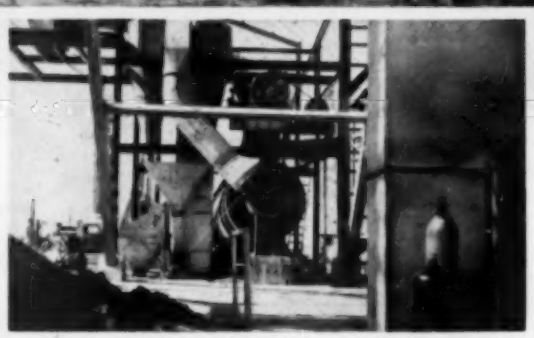

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prevention of mat formation. The toxicity of Acti-dione to *Endoconidiophora fagacearum* warrants further investigation under forest conditions for the control of oak wilt. The use of the antibiotic as a chemotherapeutant for ornamental and shade trees should be investigated also.★★

UREA NITROGEN

(*From page 42*)

relatively greater acidity present in the soil where ammonium nitrate had been used as compared to urea indicated either greater plant utilization of bases such as calcium, or greater effect on movement of bases into the subsoil below the 18-inch depth than was the case for urea.

There is more concern for development of acidity in the subsoil than for the tillable depth, because no practical means of effectively liming the subsoil has been devised. Strong acidity in the subsoil is a serious problem, and in some instances deliberate selection of nitrogen sources to help prevent its development has been suggested (5).

One of the accepted causes of sub-soil acidity is the movement of salts of ammonia nitrogen into the subsoil, followed by utilization of ammonia or its conversion to the nitrate form. The acid so freed or formed combines with bases such as calcium and increases soil acidity when leaching to still greater depths takes place. Any condition which would retard the conversion of urea to ammonia, as was found to be the case for the citrus soils, would be a potential for the development of subsoil acidity.

Nutritional Leaf Roll of Plants

THE increased use of urea may be contributing to the reduction in nitrate nitrogen noted for some fertilizers used in the Florida area. This must be given attention in the prevention and control of nutritional leaf roll of solonaceous plants (potatoes, tobacco, tomatoes, etc.). The disorder apparently results from a lack of nitrate nitrogen in the presence of a more or less normal con-

TABLE 3

Effect of Nitrogen Source and Quantity on Yield of Pasture Grasses, 1953.

Pounds N and Source	Tons Dry Weight Yield per Acre	% N	% of N Application in Harvest	Inches Water Leached	% of N Application Leached
		Pensacola Bahia Grass			
360 Urea	6.37	1.73	61.2	21.9	3.9
360 Ammonium Nitrate	6.35	1.78	62.8	Lost	—
180 Ammonium Nitrate	4.01	1.41	62.8	25.1	1.1
		Pangola Grass			
360 Urea	4.89	1.78	48.4	28.3	12.2
360 Ammonium Nitrate	4.86	1.74	46.9	25.9	9.2
180 Ammonium Nitrate	3.71	1.41	38.1	27.9	4.4
		Coastal Bermuda Grass			
360 Urea	6.02	1.69	56.5	24.9	8.1
360 Ammonium Nitrate	5.14	1.66	47.4	28.3	15.6
180 Ammonium Nitrate	2.80	1.41	43.9	28.1	11.6

Nitrogen applied monthly at 60 or 30 pounds for March, April, May, June, August, September. Thirty pounds each of P_2O_5 and K_2O also applied at these times.

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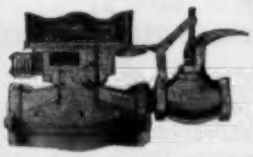

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Cornell University, Ithaca, N. Y.

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26 Illustrations

TABLE OF CONTENTS

Classification of Insecticide Dusts Diluents and Carriers.

Composite list of Companies Handling Diluents and Carriers

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Sulfur	Talc
Tripolite	Pyrophyllite
Diatomite	Montmorillonid Group
Calcium Limes	Kaolinite Group
Magnesium Limes	Attapulgite Group
Calcites	Unidentified Clays
Dolomites	Phosphates
Gypsum	Indeterminates
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centration of ammonical nitrogen (6). It occurs primarily on very acid soils, virgin soils, or fumigated soils where nitrification is slow and nitrate nitrogen has not been properly balanced against ammoniacal nitrogen in the fertilizer. Nutritional leaf roll has been a problem with Irish potatoes, but is now largely corrected by liming and the use of not less than one-fifth of the nitrogen in the nitrate form. Recent investigations by the writer using tomatoes in rapid-flow solution cultures indicate that nutritional leaf roll results not only from ammonia as such if nitrate is low, but also when nitrogen is taken up from urea solutions.★★

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TABLE 4

Effect of Urea and Ammonium Nitrate on Surface and Subsoil Acidity.

Nitrogen Treatment 3/1/52 to 10/1/53	Grass	Soil Depth Inches	Soil pH 3/8/50	Soil pH 3/24/54
840 lb. Urea Nitrogen	Bahia	0-2	6.37	5.57
		2-10	6.37	5.80
		10-18	5.44	5.95
	Pangola	0-2	6.34	5.41
		2-10	6.34	5.81
		10-18	5.56	6.09
	Bermuda	0-2	6.32	5.32
		2-10	6.32	5.32
		10-18	5.56	6.00
840 lb. Ammonium Nitrate Nitrogen	Bahia	0-2	6.27	4.95
		2-10	6.26	5.42
		10-18	5.56	5.79
	Pangola	0-2	6.27	4.90
		2-10	6.27	5.38
		10-18	5.44	5.75
	Bermuda	0-2	6.17	4.91
		2-10	6.17	5.44
		10-18	5.44	5.78
420 lb. Ammonium Nitrate Nitrogen	Bahia	0-2	6.18	5.35
		2-10	6.18	5.58
		10-18	5.44	5.80
	Pangola	0-2	6.24	5.25
		2-10	6.24	5.70
		10-18	5.66	5.75
	Bermuda	0-2	6.27	5.08
		2-10	6.27	5.70
		10-18	5.56	5.65

Soils below pH 5.0 are strongly acid, from 5.0-6.0 moderately acid, and pH 6.0-7.0 slightly acid. The various 60 lb. treatments of nitrogen added in 1951 had no apparent differential effect on pH values.

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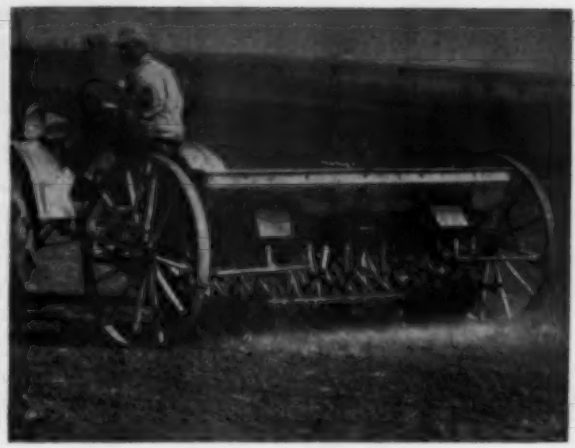

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6. Volk, G. M. and Nathan Gammon, Jr. Effect of liming and fertilization on yield and correction of nutritional leaf roll of Irish potatoes. Fla. Agr. Exp. Sta. Bull. 504. 1952.

MALATHION FORMULATIONS

(*From Page 45*)

ions play an important role in the chemical stability characteristics of malathion wettable powder formulations. Some correlations of the effects of moisture, temperature, pH and filler type on stability of malathion are reported in Table III.

Fillers were selected to cover a range of pH and moisture content characteristics. Four particular carriers, Attaclay, Bentonite 475, Barden clay and Celite 800, were specially dried to contain only a fraction of their normal moisture content, and stability of malathion preparations using dried and undried carriers was determined.

Results show that with filler types used the presence of moisture accelerates rate of breakdown of malathion, and while pH is also a factor, its effect is least in compositions having low

TABLE III

Effect of pH, Moisture and Temperature on Stability of Malathion Wettable Powders

Filler and Source	% H_2O	pH	% Malathion Initial	7 Days at 50°C.	4 Weeks at r. t.
Attaclay (as received) Minerals and Chemicals Corp of America	7.0	7.6	16	10	15
Attaclay (specially dried) Minerals and Chemicals Corp of America	0.3	7.6	16	14	—
Barden Clay (as received) J. M. Huber Company	0.6	4.5	16	16	16
Barden Clay (specially dried) J. M. Huber Company	0.2	4.5	16	16	—
Bentonite 475 (as received) Whittaker, Clark & Daniels, Inc.	10.0	6.2	16	11	15
Bentonite 475 (specially dried) Whittaker, Clark & Daniels, Inc.	0.5	6.2	16	16	—
Celite 800 (as received) Johns-Manville Corp.	4.0	8.7	16	11	13
Celite 800 (specially dried) Johns-Manville Corp.	0.6	8.7	17	11	—
Frianite HP Calif. Industrial Minerals Company	0.2	7.1	17	17	—
Kaolinite Type 41 Clay Southeastern Clay Co.	0.8	5.1	17	16	—
Panther Creek Bentonite Amer. Colloid Co.	10.0	6.0	17	11	—
Pikes Peak 9418 General Reduction Co.	8.2	5.4	17	12	—
Floraid Floridin Company	0.9	8.6	17	13	—
Celite 209 Johns-Manville Corp.	2.1	7.0	17	17	—

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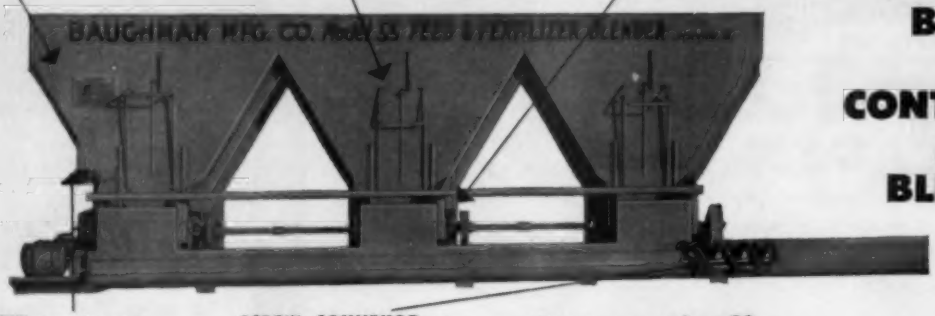

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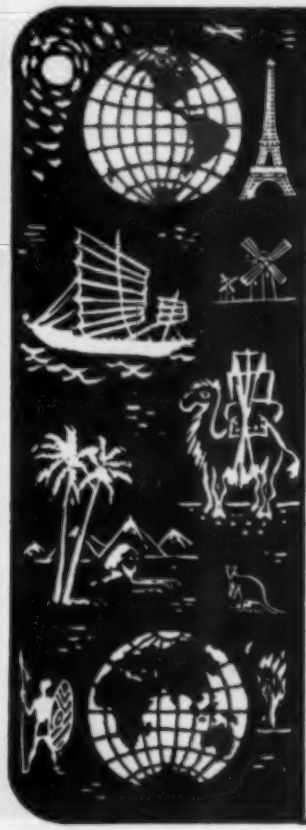

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moisture content. High temperature also markedly accelerates rate of malathion breakdown. Stable wettable powder preparations are possible with proper choice of carrier.

Other long-term stability tests, including miscellaneous fillers, were also carried out. Results are recorded in Table IV.

Carriers giving the most stable malathion formulations include acidic kaolins such as Barden Clay, Kaolinite Type 41 Clay; Pikes Peak 9T66, a calcined montmorillonite; acidic frianites and diatomaceous earths. Several percent loss in actual grade is found for wettable powders prepared with Attaclay during one year's storage at room temperature. In general, a slightly acidic or neutral reaction pH 4-7, and low moisture content (calcination preferred) are desirable characteristics for inerts to be used in the preparation of malathion wettable powders. With even the best carriers tested, an overage of at least 1% actual malathion is recommended in commercial preparations expected to meet guarantees after long-term storage. (*To be continued in Oct.*)

TABLE IV
Stability of Malathion Wettable Powders

Filler and Source	% of Filler	% Malathion (r.t. unless otherwise indicated) Initial	2 weeks at 50°C.	1 mo.	2 mo.	3 mo.	6 mo.	9 mo.	12 mo.	18 mo.	24 mo.
Barden Clay—J. M. Huber Co.	60	23	—	—	—	24	—	—	23.5	—	19.7
Celite 209—Johns-Manville Corp. (stored at 43°)	12										
Barden Clay	60	23	—	—	—	—	—	—	24.0	—	22.7
Celite 209	12										
Barden Clay	52	25.5	—	24.9*	—	25.4	25.6	—	24.2	—	22.7
Celite 209	20										
Barden Clay	57	23.8	—	21.8*	—	24.7	22.8	—	23.0	—	—
Isocel M—Innis Speiden & Co., Inc.	15										
Barden Clay	57	23.8	—	22.1*	—	23.8	22.4	—	22.7	—	—
Attaclay SF—Minerals & Chemicals Corp. of America	15										
Barden Clay	57	25.2	—	25.0	—	24.6	24.9	23.4	—	—	—
Celite SSC—Johns Manville Corp	15										
Kaolinite Type 41 Clay—Southeastern Clay Co.	52	24.8	—	21.3*	—	25.3	24.9	—	25.1	—	23.4
Celite 209	20										
Attaclay—Minerals & Chemicals Corp. of America	60	36.7	—	31.2*	—	34.6	33.2	—	—	—	—
Attaclay	72	25.1	—	20.2*	—	22.9	21.1	—	20.6	—	18.5
Diluex A Calcined—Floridin Co.	—	23.6	16.8*	—	—	18.3	17.7	15.6	—	—	—
Diluex A Calcined	49.6	24.3	19.4*	—	—	22.1	21.7	20.5	—	—	—
Celite SSC	24.8										
Frianite TP—Calif. Industrial Minerals Co.	—	14.4	15.0*	—	12*	14.5	15.2	14.5	—	—	—
Frianite 25X	—	25.4	—	—	23.8	—	25.9	—	24.9	25.7	—
Frianite TP	48	25.5	24.7*	24.5	—	25.3	24.6	24.6	—	—	—
Celite SSC	23										
Celatom MP 61—Eagle Picher Sales Co.	48	25.1	25.8*	25.4	—	25.4	24.4	25.2	24.1	—	—
Frianite TP—Calif. Industrial Minerals Co.	23										
Celatom MP 61	48	24.7	25.2*	25.2	—	24.9	24.7	25.8	25.6	—	—
Frianite M3X	23										
Celite SSC	—	25.2	25.9*	—	—	24.9	25.0	23.6	—	—	—
Dicalite PS—The Dicalite Co.	—	25.5	25.4*	—	21.8*	24.6	—	—	—	—	—
Celatom MP- 61	—	24.9	25.0*	—	22.2*	25.6	25.2	24.5	—	—	—
Pikes Peak 9T66—General Reduction Company	—	25.8	22.0*	26.0	—	24.2	22.7	24.3	22.9	—	—
Pikes Peak 9T66	48	25.1	22.5*	25.4	—	25.1	23.6	23.4	23.6	—	—
Celite SSC	23										
Hysorb Clay—Wharton Jackson Co.	—	25.7	—	—	24.9	—	25.6	—	25.1	25.8	—
Seminole Clay—Southeastern Clay Co.	—	24.1	—	—	22.4	—	24.6	—	23.2	24.4	—
Filtrol X 603—Filtrol Corp.	—	22.0	—	—	18.7	—	20.9	—	15.6	—	—

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'56 PESTICIDE PROGRAMS

(*From Page 69*)

not plan spray programs without definite guidance.

Another problem that looms from time to time is the farmer who needs a quick and accurate determination of his residue load during the growth period to guide his application program during the remainder of the growing season. Growers more than ever are looking to the various agencies of government and industry to help them develop their spray schedules.

Regional and National Considerations

With the availability of increased federal funds for agricultural research for both regional and experiment station projects, attention is being turned to residue problems as being worthy of support. Their development will have a tendency to bring about research of a regional nature through cooperative effort from state and federal workers, and provide the basis for a better exchange of current information within the region. Studies of soil residues, the effect of pesticides on flavor and quality, surface residues remaining on treated commodities, and the like, are considerations of such programs. It seems likely that more attention may be given to this approach in the future.

Additional state funds are being requested by some experiment stations to meet the expanding needs in particular areas. Through studies currently underway it would appear that some national effort to assist in the pesticide residue and evaluation programs may be suggested. We need a system of pooling the information from all over the country to help all concerned with the problem.

Industry Plays An Important Role

Through grants of money to state and federal research projects, through cooperative planning of research programs enabling samples of treated commodities to be shipped to industrial laboratories for residue determinations, and through technical service programs, the pesticide industry has been a major factor in advancing our knowledge of pesticide residues at harvest. In their own laboratories, research in development of analytical methods is conducted and the methods shared with others who need them. Such cooperative work is an effective means of obtaining the necessary information in the shortest possible time. Data from such cooperative research frequently is of value to companies in applying for tolerances and label registration of products. This working relationship must continue as an integral part of future programs.

Grower Education Still Paramount

This point has been discussed many times and will always continue to be important. Pesticides change, new practices develop, infestations arise suddenly—these and many other factors must be considered by the farmer to whom pest control is only one phase of his over-all operation.

Under existing legislation, however, the farmer must as never before, know what he is doing when he uses pesticides, or run the risk of getting into difficulties. The informed grower has some appreciation of the requirements established by the Miller Bill, but it has not become a part of his planning as fully as it likely will in 1956. The "trying out" of new products without first knowing whether they are acceptable for the proposed use, may be discouraged as seizures of crops take place where illegal use has been made of a pesticide. The interval between the last application and harvest poses a real problem if infestations develop late.

To meet the situation as best we can, industry and government must continue in their contacts with agricultural producers to give them the facts and hope they in turn will use good judgment and responsibility in using recommended pesticides. The vast majority of farmers want to and will follow recommendations, but there will always be the few who will follow their own inclinations and suffer the consequences if wrong.

Experimental Compounds

Many workers are still concerned with a workable proceedure for conducting research with chemicals prior to the stage where tolerances have been set. Cooperative experiments with growers have been an established proceedure throughout the country. Now we face the problem of field evaluation of candidate pesticides prior to tolerance establishment on a basis where control of treated commodities must be maintained—if residues are present.

The purchase of crops from experimental plots is not always feasible. Experiment Station plots may fail to provide the diversity of infestations needed for research. Industry cannot afford the cost of research for establishing tolerances for all candidate materials without some knowledge of their value based on field performance. These and similar comments always come up when the over-all problem of conducting research is discussed. Proceedures for conducting small plot research with new pesticides must receive careful consideration before the 1956 season.★★

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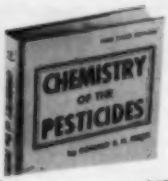

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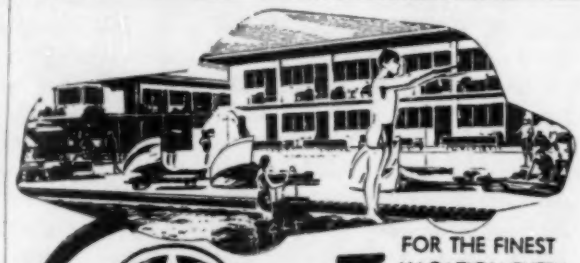

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Index to ADVERTISERS

Tale Ends

BOLL weevil infestations serious in a wide section of the cotton south." . . . "Corn insects causing widespread damage throughout the nation." These typical reports, and dozens like them, were troubling farmers throughout the country last month; but in the pesticide industry's customary version of that old theme, "It's an ill wind that blows nobody good," the result was a rush of business for insecticide manufacturers and formulators. Most of them were reporting the best sales totals in the past four seasons. Look for faces wreathed in smiles as NAC members meet at Spring Lake early in September.

AC

Naugatuck Chemical Division of U.S. Rubber have a promising new product called "Duraset." Licensed for use this season only on lima beans, it acts to help set and hold blossoms during the bloom period. It is reported also to be showing an unexpected additional property,—it promotes bloom production. More can be expected of it in the 1956 season, with a probable wider field of application.

AC

Back to college for Dick Both of Hercules Powder Co. Dick recently completed his second three weeks term at Rutgers University, New Brunswick, N. J. where he attended a marketing school. Two three week terms, a year apart. And in the intervening 49 weeks, Hercules' competitors offer a post graduate course.

AC

S. F. Potts, entomologist with the Division of Forest Insects Research, USDA Forest Service, New Haven, Conn., is currently completing work on a book which will cover the whole broad field of insecticide application equipment. To be titled "Spray Equipment, Mixtures and Application Methods" it will be off the press some time in mid 1956. To be published by Dorland Books, Caldwell, N. J.

AC

Collectors Item: One of our charter subscribers reports that he has a complete set of issues of Ag. Chemicals back to Vol. 1, No. 1 for sale as a unit. Anyone interested? Name and address on request.

AC

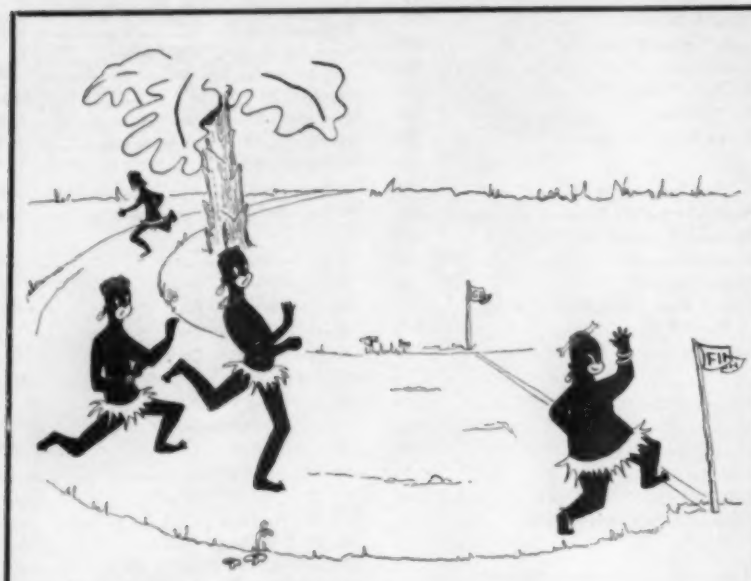
Joe Noone's many friends may not see him at the NACA Spring Lake meeting this year. He is recovering from two heavy blows—one from virus, the other requiring brain surgery. Joe always looked forward to these meetings with the industry and members always found him willing to share a problem or a laugh.

We all join in hoping that he'll be on deck soon again. If he doesn't get to Spring Lake Joe would be glad to hear from you at his home:

Joseph A. Noone
6003 Wood Acres Drive
Washington 16, D. C.

AC

The National Plant Food Institute has recently completed plans to produce a new 13½ minute TV film in cooperation with the USDA's Soil Conservation Service on the importance of conservation in relation to soil fertility. When completed the film will be available to NPFI members. The Association is preparing also a recorded Farm Radio News Service to be used by some 900 radio stations in late August and September. The service consists of four 3-minute talks by authorities in the field of agriculture . . . and is sent to interested stations, on request.



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